CLASSICAL MECHANICS
880:166g:01
Fall 2009

INSTRUCTOR: Dr. Michael W. Roth

OFFICE: Physics (Begeman) 313

OFFICE HOURS: M 11 and 1; T 11 and 3; W 11 and 1; Th 3; F 11 and 1
        (Note: All time extensions are the more reasonable ones)

PHONE: 296-6703 (cell); 273-7336 (office)

E-MAIL: rothm@uni.edu

URL: http://faculty.cns.uni.edu/%7Erothm/roth.htm (Follow the link under the "Roth's Fall 2009 Courses" section for our course web page.)

MEETING SPACETIME INFORMATION: M,W 2 – 3:15 P.M. and F 2 – 2:50 P.M. in PHY 114

COURSE DESCRIPTION: Classical Mechanics covers vectors and kinematics, force and motion, work and energy, Lagrangian and Hamiltonian mechanics, gravity, oscillations, rigid-body motion and accelerated reference frames.

OBJECTIVES: The mission of Classical Mechanics is to spark interest in the eyes of students, to have students question and analyze the world around them, to have students think, and for the class to be an experience far deeper than just a series of meetings and deadlines. At a more pragmatic level, Classical Mechanics will help the student prepare for a career in any field(s) where science is an essential component. The successful student will be able to envision how the course topics apply to situations in the everyday world as well as in technical settings-not only in conceptualization but also in proficient problem solving.

REQUIRED READING MATERIALS:

   i. Textbook: Thornton and Marion, *Classical Dynamics of Particles and Systems,* Brooks/Cole (2003).

PREREQUISITE(S)/COREQUISITES: *Calculus II* (800:061); *Physics III: Theory and Simulation* (880:132); junior standing.

SPECIAL NEEDS: The Americans with Disabilities Act of 1999 (ADA) provides protection from illegal discrimination for qualified individuals with disabilities. If you have any condition such as a physical or learning disability, which will prevent the fullest expression of your abilities or will require academic accommodations and would like to request instructional accommodation

due to disabilities, you must arrange for such accommodation through the Office of Disability Services, 213 Student Services Center, Tel. 273-2676.

GRADING: I have tried to make every major effort for you in this class worth a "test score", or 100 points. Your grade will be calculated based on the best 9 homework sets, 3 exams and one final examination with the following weights:

> best 9 **homework sets** of equal weight (100 pts. possible total; lowest one dropped)
> 3 **exams** of equal weight (300 pts. possible for all exams; none dropped)
> 1 **final exam** (100 pts. possible; not dropped)

Although any appropriate curve(s) will be announced in class, *it is assumed that the following standard scale will be utilized*. The grade cutoffs are as follows:

93% and above A,	77% C+,	60% D-,
90% A-,	73% C,	below 60% F
87% B+,	70% C-,	
83% B,	67% D+,	
80% B-,	63% D,	

ATTENDANCE: Although roll is not formally taken in class, it is expected that all participants with body temperatures above 80F will attend regularly. (If you are not in this category please see me.) If there is a reason that you must miss class please talk with me to make arrangements to cover the material.

LATE POLICY: Homework sets are due on the dates indicated on the class calendar, with a grace period up through the end of the day on the following Monday. I realize that having a weekend to finish things up could considerably help you, which I am all for! Your work is due on time, with the exception of reasonable documented excuses. *Late work will be docked 10% of face value for each day of tardiness and 50% per day after solutions have been posted.* If you are going to miss a test, you **must** notify me in advance (preferably one week) so alternative arrangements can be made. If you miss a test or quiz, which is not excused, a grade of zero points will have to be assessed for that particular piece of work. You must take all three exams as well as the final exam in order to pass the course.

 ACADEMIC DISHONESTY/PLAGIARISM: Collaboration on homework and certainly labs/activities is welcome, but please keep in mind that your final, turned-in work should be your own and not copied. Although collegiality is encouraged and supported, no form of cheating/plagiarism will be tolerated in this class. If anyone is suspected of academic dishonesty, I will privately speak with them in an attempt to reach a solution to whatever problem is manifesting itself. If anyone is without doubt determined to be cheating on a given assignment/test and no resolution can be offered, *negative credit will be given*. In extreme cases, the Department and/or College administration will become involved.

GENERAL PHILOSOPHY: In a nutshell, I believe in having fun while teaching and learning physics. I want you to do your best in a subject that is not easy. If you get behind and the class feels like a diesel tractor pulling you through mud, feel free to use me as a resource to help you. Although I love to do research, your learning and class performance is more important! Asking questions in class is strongly encouraged. If you don't wish to ask questions in class please come by my office, give me a call, make an appointment or even send me anonymous e-mail! Also, I like to talk a little about related contemporary issues in class, so if you've found an interesting newspaper clipping or watched a good documentary you'd like to share with us, please mention that. The most entertaining to me are tabloid articles that beg to be de-bunked using physics. I hope you find that physics is everywhere around you and not just in a class you had to take.

EXTRA CREDIT POLICY: Extra credit that adds to your score or substitutes for missed work is not offered in this class. However, I want to encourage you to feel like a part of the Department and I want to expose you to other scientists. Pursuant to that philosophy, I encourage you to go to our seminars, usually at 4:00 P.M. on various Wednesdays and listed on our website at http://www.physics.uni.edu/geninfo/events.shtml. If you turn in one-page handwritten reports to me over the talks, I will keep track of quantity you have turned in. Although not a guarantee, these reports can often be helpful for persons in a borderline grade situation (being within about 1% of a particular grade).

ABOUT THE HOMEWORK: Homework sets need not be typed but should be neat and readable. Answers to any conceptual questions should include all reasoning. Answers to quantitative problems should show all steps taken to get the answer. Since you will be provided with numerical answers to all the problems, answers to homework problems that are only a number with no supporting reasoning will not be given credit. The "Optional" homework set may be completed and count for one of your 9 best assignments.

INSTRUCTOR'S STATEMENT: The instructor reserves the right to modify this syllabus in a reasonable fashion and in the best interest of the class.

CLASSICAL MECHANICS SCHEDULE – FALL 2009

Week	Day	Date	Topic(s)	Text Chapter	Item(s) Due
1	M	Aug. 24	Introduction / Math Background	1	
	W	26	Math Background / Vector Operations	1	
	F	28	Problem Solving	1	
2	M	31	Vector Operations / Matrices	1	
	W	Sept. 2	Single Particle Newtonian Mechanics	2	
	F	4	Problem Solving	2	**Homework 1 (CH 1)**
3	M	7	**No Class – Labor Day**		
	W	9	Single Particle Newtonian Mechanics	2	
	F	11	Prob. Solving	2	
4	M	14	Oscillations	3	
	W	16	Oscillations	3	
	F	18	Problem Solving	3	
			Exam 1 Passed Out (CH 1,2)		**Homework 2 (CH 2)**
5	M	21	Oscillations	3	
	W	23	Oscillations	3	
	F	25	Problem Solving	3	**Exam 1 (CH 1,2)**
6	M	28	Chaotic Systems	4	
	W	30	Gravitation	5	
	F	Oct. 2	Problem Solving	5	**Homework 3 (CH 3)**
7	M	5	Gravitation	5	
	W	7	Calculus of Variations	6	
	F	9	Prob. Solving;	6	**Homework 4 (CH 4)**

Week	Day	Date	Topic(s)	Text Chapter	Item(s) Due
8	M	12	Calculus of Variations	6	
	W	14	Lagrangian Mechanics	7	
	F	16	Mid – Semester Eval. / Problem Solving	7	**Homework 5 (CH 5)**
			Exam 2 Passed Out (CH 3-5)		
9	M	19	Lagrangian Mechanics	7	
	W	21	Hamiltonian Mechanics	7	
	F	23	Problem Solving	7	**Exam 2 (CH 3-5)**
10	M	26	Hamiltonian Mechanics	7	
	W	28	Lagrangian / Hamiltonian Mix	7	
	F	30	Problem Solving		**Homework 6 (CH 6)**
11	M	Nov. 2	Lagrangian / Hamiltonian Mix	7	
	W	4	Central Forces	7	
	F	6	Problem Solving	7	
12	M	9	Central Forces	8	
	W	11	Central Forces	8	**Homework 7 (CH 7)**
	F	13	Class cancelled – Argonne Trip		
			Exam 3 Passed out by email (numerical plus CH 5-7)		
13	M	16	Systems of Particles	9	
	W	18	Systems of Particles	9	
	F	20	Problem Solving	9	**Exam 3 (numerical plus CH 5-7)**

Week	Day	Date	Topic(s)	Text Chapter	Item(s) Due
14	M	23	**No Class - Thanksgiving**		
	W	25	**No Class - Thanksgiving**		
	F	27	**No Class - Thanksgiving**		
15	M	30	Accelerated Coordinate Systems	10	
	W	Dec. 2	Accelerated Coordinate Systems	10	
	F	4	Problem Solving	10	**Homework 9 (CH 9)**
16	M	Dec. 7	Rigid Bodies	11	
	W	9	Rigid Bodies	` 11	
	F	11	Student Example Request Day **Final Passed Out (CH 8-11)**		**Homework 10 (CH 11)**
17	F	18			**Final Exam (CH 8-11)**

Classical Mechanics Homework List – Fall, 2009

Homework Set	Text Chapter	Problems
1	1	8, 10, 11, 13, 14, 27, 33, 36
2	2	8, 11, 15, 38, 40, 43, 53
3	3	7, 9, 10, 42, 43
4	4	4, 8, 9, 11
5	5	2, 13, 14, 15
6	6	2, 4, 9,10
7	7	3, 4, 22, 25, 26, 38
8	8	7, 14, 22, 31
9	9	15, 37, 61
9	10	9, 13, 19
10	11	13, 20
Optional	12	3, 18,21