Classical Mechanics I

PHYS 3121

Fall 2009

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Office Hours: To be announced.

Preparation: Prerequisites: PHYS 3101 (or ECGR 3121 or MEGR 2142) with a grade of C or better, and MATH 2171. Corequisite: MATH 2241.

Required Text: *Classical Mechanics*, by John R. Taylor (University Science Books)

Supplementary materials: Microsoft Excel or other graphics software and scientific calculator.

Supplementary Textbooks: *Analytical Mechanics,* by Fowles and Cassiday, 7th edition (Thomson, Books, Cole); *Classical Dynamics of Particles and Systems*, by Marion 2nd Edition (Academic Press)

Topics to be covered: Newtonian mechanics and drawing free body diagrams; Vector algebra for rectangular and curvilinear coordinates, coordinate transformations; Topics on projectiles and charged particles without and with viscous friction; Taylor expansions and the **spherical horse approximation**; Mathematical analysis using complex numbers and phasors; Linear momentum and angular momentum; Fundamental concepts of kinetic energy, work and potential energy; Some vector calculus including line integrals; Harmonic oscillators that are simple, damped and driven; Fourier series analysis of vibrational motions with application to driven harmonic oscillators, Introduction to calculus of variations and a sneak peak of Lagrange mechanics that will be covered in depth in Classical Mechanics II.

Pace of course: The first six chapters of the book will be thoroughly covered in order.

Examination and Grading Procedures: Your total grade will be made up from:

40% homework assignments, comprising problem solving.

15% bullet quizzes based on textbook reading assignments, class notes and graded problems.

45% tests (two midterms and a comprehensive final each worth 15%)

Grade scale: A (100% to 90%), B (89% to 80%), C (79% to 70%), D (69% to 60%), F (below 60%) The median or average grade for the class is not predetermined. In other words, no grading curve will be used in this course. However, there will be plenty of opportunities for you to acquire bonus points.

***Bonus points*:** (Your hard work in this class will be rewarded many times over.)

1. Class participation can boost your grade by a maximum of 3% (but do not count on any boost).
2. Adding 15% to your final course grade is possible from extra credit on homework problems. Per homework assignment, you have uniform opportunity to gain bonus points.
3. If your final exam score is greater than the *average* of your two midterm exams, then the difference between your final and average midterm score will be given as bonus points to your lowest midterm exam score. CAUTION: Beware that almost always this has no affect on increasing your letter grade.

*** Note:** I reserve the right to change class policy to serve the best interest of the class.

Homework: Approximately 15 to 20 pages of reading, and 6 to 11 word problems will be assigned each week. Problems are ranked as 1 star, 2 stars, or 3 stars indicating increasing difficulty. Each word problem will be worth (10 points) × (number of stars listed for it). The final homework score will be calculated as follows: Total homework score = 55% × (Total number of points you get correct on assigned homework problems) ÷ (Total number of points assigned as homework problems over the semester). Examples: If you get 1020 points out of say 1400 points, you will get a perfect homework contribution, but no extra credit. If you get 1273 points correct out of 1400 points, you will have about 10% extra credit, equivalent to a full letter grade increase! Sometimes you will not have time to do all the homework. This mechanism gives you some flexibility on time management. *No homework scores will be dropped.*

Homework due dates: Assignments given out during one week are always due on the Tuesday class of the following week. Generally, if you have good reason for needing extra time, extensions are given up to the end of the week. In this case, you must turn in your homework by Friday, at 5:00pm or risk not having your homework graded at all. To go beyond this Friday deadline, a written late excuse for either medical reasons, or for other accepted University activities, are required to get further extensions. No points are deducted for being late. Either the homework is graded, or it is ***not graded if the deadline has passed***.

Midterm and Final Exams: All exams will be given in class. **Exam I** will be on **Oct 15**, and **Exam II** will be on **Nov 19**. The **Final Exam** will take place on Tuesday, December 15th from 2:00pm to 4:30pm.

Midterm I: Covers chapters 1 and 2 plus supplementary review materials.

Midterm 2: Covers chapters 3 and 4, and requires complete command of all topics in chapters 1 and 2.

Final exam: Comprehensive exam over all topics in chapters 1-6, with emphasis on chapter 5.

Quiz Coverage: Short quizzes are every Thursday, based on homework due for the previous Tuesday.

Quiz Environment: Just pen or pencil allowed. The quizzes will be 20 minutes long given at ***beginning*** of class. If you come to class a little earlier, I will start the quizzes a bit earlier.

Test Environment: In class closed booked exams.

Study Groups: You are ***strongly encouraged*** to work together in study groups. However, you cannot copy from one another (see Integrity). I recommend you do the work on your own in advance of any planned meeting with classmates, friends, tutors or mentors. When you are together, discuss and ***critically assess*** your solution compared to other's solutions. In cases that everyone is stumped on a problem, then a discussion of how to start the problem should be done, and everyone works on their own. If someone has a solution, but you do not have it, then ***you may fish for hints***, but do not look at the solution. Comparing solutions should only be done after you have a solution! You may trash your solution in favor of another approach. However, you should rework the solution on your own … without looking at anything.

Data Mining for solutions: I cannot prevent you from looking at auxiliary resources to get solutions. This practice ***will hurt you*** in the long run if you develop the bad habit of looking up solutions to problems before you develop your own. When you absolutely need to do this to get started, do not copy the solution (see Integrity). Instead, read the solution, try to understand the approach, and then walk away from it. In a day or so, try to work the solution on your own. **Whenever you look at a pre-worked solution** to help you solve a problem, you are **obligated to reference the source** within your solution.

Integrity: Students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are set forth in the Code. The Code is available from the Dean of Students Office or online at: http://www.legal.uncc.edu/policies/ps-105.html