Physics 303 – Modern Physics **Syllabus** **Block 5 – 2013-14**

Professor: Kara Beauchamp **Office:** West Science 023
Office Phone: x4515 **Office Hours:** M, F 11am-12 N ; Th 3pm-4pm
and by appointment

Textbook: Six Ideas that Shaped Physics, Thomas A. Moore, McGraw-Hill (1998). Unit Q and Unit T. I will also provide some supplementary reading materials.

Other supplies you will need: a good scientific calculator.

Schedule: We will meet from 9 am-11 am and 1 pm-3 pm each day. We will cover approximately two chapters each day. I will cover new material from 10-11 am and from 1-2 pm (or so). I will be present in the classroom until 3 pm to answer questions on the newly assigned homework problems.

Course Philosophy: This class will cover quantum mechanics and statistical mechanics. Quantum mechanics explains the behavior of particles whose wave-like nature is important (usually small particles like electrons, protons, and neutrons, but under the right circumstances, also whole atoms or molecules). Statistical mechanics explains the collective behavior of quantum mechanical systems (like gases, liquids, and solids). In this class, you should focus on gaining a qualitative understanding of the phenomena as well as an ability to solve problems using equations. I will also ask you to be able to *derive* and *describe* equations which you use (for instance, on a test), not just *use* the equations.

As is the case in all physics classes, you will learn the most in this class by practicing active learning. You should not just listen to what I tell you – you should take notes, jot down questions, and work the in-chapter exercises while you read the text, express new concepts in your own words, and read over your class notes before working on homework problems. Much of your learning will come through doing homework problems. I will do some combination of lecturing and asking you questions during class and occasionally you will work on in-class exercises. It is important for you to read the chapter before coming to class so that you are ready to think about the material in class.

Math: This course will probably be more mathematically intensive than the previous physics courses you have taken. During the block, you will be asked to carry out extensive algebraic manipulations, often involving trigonometric functions, as well as partial derivatives involving the chain rule and a variety of integral techniques, including integration by parts. I will also introduce functions of complex numbers and methods of finding solutions to a few, specific types of differential equations. You will also use Mathematica, specifically to carry out integrals and to graph complicated functions.

Academic Honesty: Cornell College expects all members of the Cornell community to act with academic integrity. An important aspect of academic integrity is respecting the work of others. A student is expected to explicitly acknowledge ideas, claims, observations, or data of others, unless generally known. When a piece of work is submitted for credit, a student is asserting that the submission is her or his work unless there is a citation of a specific source. If there is no appropriate acknowledgement of sources, whether intended or not, this may constitute a violation of the College's requirement for honesty in academic work and may be treated as a case of academic dishonesty. The procedures regarding how the College deals with cases of academic dishonesty appear in The Compass, our student handbook, under the heading "Academic Policies – Honesty in Academic Work."

Students with disabilities: Students who need accommodations for learning disabilities must provide documentation from a professional qualified to diagnose learning disabilities. For more information see cornellcollege.edu/disabilities/documentation/index.shtml. Students requesting services may schedule a meeting with the disabilities services coordinator as early as possible to discuss their needs and develop an individualized accommodation plan. Ideally, this meeting would take place well before the start of classes. At the beginning of each course, the student must notify the instructor within the first three days of the term of any accommodations needed for the duration of the course.

Assignments:

Reading:

The chapters that we will cover each day are listed on the schedule. I will post more details on the reading on Moodle, with the homework. I expect you to read the assigned chapters, either before or after class. I encourage you to work the in-chapter exercises as you read.

Problem Sets:

Daily problem sets will be assigned. These problems are for you to develop your physics muscles, by practicing. You are encouraged to work on these assignments with your classmates, both during designated class time and outside of class, and to consult with me on any questions you may have. Problems assignments will be posted on Moodle before we cover the material in class. You will not turn in most of these problem solutions. Occasionally, I will assign homework that you will turn in.

Homework Quizzes and Presentations: (Approx. 120 pts)

Every morning at 9:40 am, we will have a quiz over the homework. On the morning of the quiz, I will randomly select one problem from each chapter's homework as the quiz questions. The quiz is closed book, but you will be able to use your notes. You must have all of the information you need to completely write up the problem in your notebook. I expect that before you start the quiz you will have completed all of the homework problems, and that you will spend the quiz time re-writing your solution neatly onto a separate piece of paper to turn in. I will end the quiz 5 minutes after 80% of the students have turned in their quiz. If you are unable to complete the quizzes in the allotted time, please meet with me to discuss the situation. Occasionally, I will ask you to present a homework problem solution on the board instead of taking a quiz.

*Article Responses (*Approx. *30 pts)*

We will all read two recent research articles that cover topics related to this course. You will write a short response to the articles. (More information will be provided).

Exams: (300 pts total)

There will be three exams (100 pts each). The exams will consist of short answer questions, definitions, derivations, and problems. The problems will be similar to the homework problems. You will be able to bring to the exam an equation sheet which you make up.

Exam 1:	Monday, January 21, 12:30 pm to 3 pm
Exam 2:	Tuesday, January 29, 8:30 am to 11 am
Exam 3:	Wednesday, February 6, 9 am to 11:30 am

Grading Scale:

My grading scale is approximately the following, although I reserve the right to adjust it slightly if I think my exams are too easy or too hard.

A: 95 -100, **A-:** 90-94, **B+:** 85-89, **B:** 80-84, **B-:** 75-79, **C+:** 70-74, **C:** 65-69, **C-:** 60-64, **D:** 45-59, **F:** below 45

Schedule – Physics 303 – Block 5 2012-13

Date	Day	Time	Reading	Topic	Class Activity
Jan 14	Mon	AM	Ch Q1, Q5.6	Standing Waves	
		PM	Ch Q2	Interference	
Jan 15	Tues	AM	Ch Q3	Light as a Particle	
		PM	Ch Q4	Matter as a Wave	
Jan 16	Wed	AM	Ch Q5.1-5.4	Probability	
		PM	Q6.1, My Ch 1, Griffiths 1.3	Quantum Theory	
Jan 17	Thurs	AM	My Ch 2, Q6.5	Schrodinger Eq	
		PM	Ch Q7.1 – 7.3 My Ch 3	Square Well	
Jan 18	Fri	AM	Ch Q10	Schrodinger Eq 2	
		PM	Ch Q11	Qualitative Soln's	
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Jan 21	Mon	AM	Q10, Q11	problem solving	
		PM			review week 1
Jan 22	Tues	AM			EXAM week 1
		PM	My Ch 4 Q6.4, Q 7.4	Free Particle Solutions, SHO	
Jan 23	Wed	AM	Q5.5, Ch Q8	Electron Spin	
		PM	7.5, Ch Q9	Atoms	
Jan 24	Thurs	AM	Ch Q12	Nuclei	Article Discussion
		PM	Ch Q13	Nuclear Stability	
Jan 25	Fri	AM	particles	particles	Article Response 1 Due
		PM	Ch Q14, Ch Q 15	Radioactivity	
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Jan 28	Mon	AM	Particles, Q14	problem solving	
		PM			review week 2
Jan 29	Tues	AM			EXAM week 2
		PM	Ch T1 Ch T2	Temperature Ideal Gases	
Jan 30	Wed	AM	Ch T3 - begin	Gas Processes	
		PM	Ch T3 - finish		
Jan 31	Thurs	AM	Ch T4	Macro/Microstates	
		PM	Ch T5	Entropy	
Feb 1	Fri	AM	Ch T6	Boltzman Factor	
		PM	Ch T7	Applications	
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Feb 4	Mon	AM	Ch T8	Entropy Changes	Article Response 2 Due
		PM	Ch T9	Heat Engines	
Feb 5	Tues	AM			REVIEW
		PM			study
Feb 6	Wed	AM			EXAM week 3