

MODERN PHYSICS PHYS305

ABSTRACT. Modern Physics is an introduction to the post Newtonian physics. It begins by discussing Maxwell's equations and the Michelson-Morley experiment and how they demanded a change in the way physicists view the world. The theory of special relativity is introduced through the Lorentz transforms and relativistic dynamics is covered in some detail. A need for Quantum Theory is introduced via blackbody radiation and the photoelectric effect. The Bohr-Rutherford model of the atom is discussed and extended to the wave-particle duality. The Schrödinger Equation is developed in one and three dimensions and used to understand the intrinsic spin of the electron, Pauli exclusion, fine structure, and spin orbit coupling. Molecular Structure and spectra are discussed with a brief introduction to Statistical physics. Depending on the class interest either Solid State physics or Nuclear and Particle physics will conclude the semester.

TEXTS:

Paul A. Tipler & Ralph A. Llewellyn *Modern Physics; 5th Edition*

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class web page:

<http://www.ashland.edu/~rmichael/ph305.htm>

1. ATTENDANCE

I will not take attendance during the semester, but within the framework of a small class it is obvious who is and is not attending classes. Even though attendance is not required let me make one point perfectly clear. If you do not attend class, you will find the homework and tests extremely difficult to pass. We are all adults and responsible for our actions, if you wish to pass the course attending all the lectures is highly recommended. With only two lectures a week missing a lecture will mean missing a large amount of material.

2. HOMEWORK

Problems from the text, with the possibility of additional problems in the form of a handout, will be assigned weekly. The homework assignment will be posted on the

class web page, and will be collected during lecture the Monday after it is assigned. It is expected that the entire assignment will be completed in the allotted amount of time. It is also recommended that you work together on the problems. It is a good idea to form a study team. Members of the team should discuss solutions and ensure every team member understands all of the problems. The homework assignments will be an integral part of your grade. It is my experience that students receiving the highest grades do all of the assigned problems as well as many unassigned problems. My advice would be to work several problems a day and do as many extra problems as your schedule will allow.

3. TESTS

Two seventy five minute tests will be given. The tests will consist of a few relevant homework style problems. You will be required to apply what you have learned, you will not just have to rework an old homework problem, but will have to use what you have learned to figure out how to do a different type of problem (i.e. you will have to develop good problem solving strategies).

4. LABORATORY

There will be four laboratory projects during the semester, Millikan Oil Drop, and e/m measurement for the electron, Nuclear Counting, and Planck's Constant, You be required to write formal reports for each of these experiments. These report should include a short history of the two experiments, a description of how you performed the experiments, and a through discussion of your data, analysis, and results. The report will need be written using \LaTeX . You will be given some class time to work in the laboratory but the bulk of the laboratory work will be done on your own time.

5. PAPER

You will be required to write two library research papers of seven to ten pages length. You will have to write the paper in a scientific publication format using \LaTeX . The topics will be tailored to the individual student. I suggest you start gathering your resources early since they might have to be attained through inter-library loan. More information on the style and content will be given early in the semester. You will also be required to present your final paper to the class in a 15 to 20 minute lecture near the end of the semester.

6. FINAL EXAM

The final exam will be given only during the assigned hours. There will be no exceptions to this time, other than the college rescheduling the time. The exam will be comprehensive.

7. MAKEUP

Missed exams or class assignments may be made up at the discretion of the instructor with prior notifications.

8. GRADING

The grades for this course will come from the in class evaluations and the paper. The value of each evaluation type is given as a percentage of the total grade as shown below.

Homework	20%
Tests	30%
Final	20%
Papers	10%
Laboratory	20%

The final grades will be assigned using the following scale as a guide;

92 → 100%	A	74 → 77%	C+
88 → 91%	A-	66 → 73%	C
85 → 87%	B+	62 → 65%	C-
80 → 84%	B	58 → 61%	D+
78 → 79%	B-	51 → 57%	D
		0 → 50%	F

9. EXTRA HELP

I keep a relatively open door for students who wish extra help. Feel free to stop by my office anytime to discuss problems you might be having or ask any questions that may arise. If I am not free we can arrange a time convenient for us both. Remember I am here to help you learn. You pay my salary, so take advantage of this opportunity. My office hours are listed above, I will make a concerted effort to be in my office during these hours should you ever need to find me.

10. ACADEMIC HONESTY

The following information is taken from the Academic Integrity Policy and Procedures section of the Student Handbook:

Academic integrity: *to complete the assignments/tests/experiences of each class on one's own. To present no work completed by others as one's own.*

Ashland University expects each student to advance the university's mission by furthering an environment that is both challenging and supportive. In such an environment a student will neither seek nor offer improper assistance. Academic integrity implicitly implies that each student will use his/her own capabilities to achieve his/her fullest potential and will neither offer nor accept aid that is not in keeping with regularly accepted standards of academic integrity.

At Ashland University academic integrity is to be revered, honored and upheld. Therefore, an academic infraction is considered a very serious matter, as it corrupts the educational process and undermines the foundation of our community. All students have an obligation to be forthright in their academic endeavors and to respect

ethical standards. The work that one submits for academic evaluation must be his/her own unless an instructor expressly permits certain types of collaboration.

You should work together on the homework and laboratory, however the laboratory reports, papers and exams are expected to be your own work. Anyone caught cheating in anyway on any assignment, quiz, or exam will receive an zero for the that assignment and will be referred to the registrar's office for further disciplinary action and may be withdrawn from the course at my discretion.

11. DISABILITY SERVICES

In accordance with Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act of 1990:

If you believe you have a disability that may warrant accommodations in this class, I urge you to register with the Disability Services Coordinator (Suzanne Salvo) so that together you can work to develop methods of addressing needed accommodations in this class. The office is located in 105 Amstutz.