

Department: PHYS

Course No.: 1221Q-122Q

Credits: 4

Title: General Physics

Contact: G. Rawitscher

Content Area: CA3 Science and Technology- Lab

WQ: Q only

Catalog Copy: 121Q-122Q. General Physics. Either semester. Four credits each semester. Three class periods and one 3-hour laboratory period. Prerequisite for PHYS 121: MATH 112 or 109 or 118 or passing score on the calculus readiness test or equivalent. Prerequisite for PHYS 122: PHYS 121. PHYS 121 is not open for credit to students who have passed PHYS 131, 141 or 151. PHYS 122 not open for credit to students who have passed 132, 142 or 152.

Basic facts and principles of physics. The laboratory offers fundamental training in precise measurements.

Course Information:

1.a). The goal of this course is to present the fundamentals of physics to students majoring in the sciences. The lectures and readings show how mathematics can successfully be used with the underlying physics. A major objective is to teach students how to apply mathematics to solving the problems.

b) The course typically requires reading and understanding of about 30 or so pages of the assigned text each week. The students are also expected to rewrite and fill in necessary details for the notes they take in class. Typically eight or nine homework problems (from the text) are assigned each week. The problems are turned in, graded, and returned (a week later) to the students. Solutions to the problems are "posted" on the Web. In addition students can discuss the problems (and other aspects of the course) with the professor in his/her office or go to the Physics Resource Learning Center for help from a graduate student. There are three "hour exams" given during the semester and a weekly quiz. The hour exams (as well as the final exam) consist of problems taken from the assigned homework problems (or minor modifications of them) as well as from the class notes. The weekly quiz is on material discussed in the most recent lectures.

c). This course is aimed at providing a basic understanding of mechanics, wave motion, heat, electricity and magnetism, optics, and selected topics in modern physics to students studying the sciences.

Meets Goals of Gen Ed:

CA3 Criteria: Acquire intellectual breadth and versatility. Students are expected to acquire knowledge about the fundamental laws determining the behavior of mechanical, electrical, thermodynamic, atomic, etc. systems. The course covers a wide range of topics involving interactions of electrical charges, the origins of magnetic fields, the energy levels of hydrogen atoms, etc. Using the basic physics presented in the course, supplemented by mathematics students should be able to understand as an example why the earth stays in its orbit. They should in addition be able to calculate the length of the year.

Acquire critical judgement. An important point of the course involves discussions on the range of validity of the physical theories presented. As an example they should learn that the classical mechanics of our everyday world is not applicable to the hydrogen atom and will not correctly describe its behavior. They will learn how to critically use mathematics (3+4 may equal 5 for example when adding vectors).

Acquire a working understanding of the processes by which they can continue to acquire and use knowledge. Although the course presents fundamental physics in many cases it shows how to extend the concepts to more sophisticated problems. It also demonstrates the use of mathematics and students can see that it is applicable to other fields.

CA3 Lab Criteria: The laboratory meets for three hours per week. The students, working in groups, do the following (hand's on) experiments. They analyze the experimental results, work out conclusions, and hand in individual laboratory reports. There is a laboratory final.

Typical semester experiments are:

Physics 121-

1. Introduction and error analysis
2. One dimensional motion
3. Forces
4. Energy
5. Momentum
6. Torque
7. Mechanical Oscillations
8. Energy Conservation

Physics 122-

1. Ohm's Law
2. Electric fields
3. Capacitors
4. DC Circuits
5. AC Measurements
6. AC Circuits

- 7. Mirrors and Lenses
- 8. Interference
- 9. Spectrum And Radiation

Q Criteria: 1. Include mathematics and/or statistics at or above the basic algebra level as an integral part of the course which is used throughout the course.

The course cannot be presented without using the basic mathematics cited above.

2. Include use of basic algebraic concepts such as: formulas and functions, linear and quadratic equations and their graphs, systems of equations, polynomials, fractional expressions, exponents, powers and roots, problem solving and word problems. Formal abstract structures used in symbolic logic and other algebraic analyses are acceptable;

3. Require the student to understand and carry out actual mathematical and/or statistical manipulations, and relate them to whatever data might be provided in order to draw conclusions. Merely feeding numerical data into a program on a computer or a calculator to obtain a numerical result does not satisfy this requirement. Technology should be viewed as a tool to aid understanding and not as a driver of content.

The assigned homework problems all require the use of mathematics. Most of the problems require careful thought and generally cannot be properly solved by "plugging" into a formula.

Role of Grad Students: -note on number of students per year: In the Fall there are 200 in 121 and 60 in 122. In the Spring there are 180 in 121 and 120 in 122.

The graduate student TAs discuss the assigned laboratory experiment of that week, help the students perform the experiments and answer questions on the underlying concepts that the experiment demonstrates. The TAs also grade the Lab reports and keep up with the material being taught in the lectures.