TAFT COLLEGE
West Kern Community College District

Reviewed By: C. Johnson
Reviewed By: D. Hillygus
Reviewed By: F. Bell
Date Reviewed: Fall 1995
Text Updated: March 10, 2011

Physics (PHYS) 2223 General Physics (Calculus) (4 Units) UC
[Formerly Physics 4C]

Prerequisite: Successful completion of Physics 2222 with a grade of "C" or higher

Prerequisite knowledge/skills: Before entering the course the student should be able to

1. apply the laws and principles of classical electricity and magnetism to the solution of problems of:
   a. forces between point charges; electric force fields and potential fields produced by individual point charges and sets of point charges and by uniformly charged surfaces and volumes having plane, spherical or cylindrical charge symmetry (Gauss' Law); potential difference calculations; and capacitance, capacitors, arrays of capacitors, and the effect of dielectrics on capacitors,
   b. current, resistance and electromotive force and direct current circuits and instruments,
   c. the magnetic field and the force it exerts on moving electric charges or currents, its production by moving electric charges or currents, induced electromotive force in conductors and electric circuits, and the magnetic properties of matter,
   d. mutual inductance and self inductance and, the basis of electrical machinery and the behavior of electric circuits involving resistance, inductance and capacitance in transient and steady state (alternating circuit) conditions,
   e. electromagnetic waves,
2. in all the subject areas in this course, be able to go beyond simple one or two concept "formula plugging" requires the identification of multiple applicable physical concepts (some of which will have been covered in prior chapters) and their use in an appropriate manner and sequence. Exams, homework problems and class discussions will be constructed to assure that students lacking this ability will be unable to earn better than a B in the course. Comprehend presentations in which calculus concepts are extended beyond those learned so far in the calculus course for specific physics needs, such as Gauss Law, and be able to explain or reproduce the derivations and apply the results to problems,
3. in all the subject areas covered in this course, display a grasp of the physical adequate to analyze and discuss questions focused on an understanding of the application of the theories in particular situations rather than on the ability to perform calculations,

4. perform assigned experiments with reasonable care and competence, and to prepare adequate experimental reports presenting the numerical results and analyzing the sources and significance of errors, and
5. list and discuss objectives of any laboratory experiment, the type of measurements made, why they were made, and how they entered into the determination of the desired result.

Total Hours per Week: 3 hours lecture; 3 hours lab

Catalog Description: Demonstration lectures, problems, and laboratory work in the fundamentals of physical optics, heat, thermodynamics, atomic and nuclear physics, relativity and quantum mechanics comprise this course which is a continuation of Physics 2222.

Type of Class/Course: Degree Credit

Texts: Young, Freedman, Sandin, Ford. University Physics. 10th Ed. San Francisco: Addison-Wesley, 2000.
Serway, Raymond A. and John W. Jewett Jr. *Physics for Scientists and Engineers with Modern Physics*. 8th Ed. United States: BROOKS/COLE CENGAGE Learning. 2010. Print.

Additional Instructional Materials: Calculator

Course Objectives:

By the end of the course, a successful student will be able to

1. apply the laws and principles of classical physics to the solution of problems in the areas of heat and thermodynamics, and geometric and physical optics, (including the basic phenomena of reflection, refraction, interference and diffraction and their application to optical instruments).
2. apply the laws and principles of modern physics to problems in basic relativistic mechanics and elementary problems in atomic, molecular and nuclear physics.
3. apply the concepts and techniques of calculus learned in a concurrent or prior calculus course, or presented in the physics course, to problems requiring them,
4. in all the subject areas in this course, be able to go beyond simple one of two concept "formula plugging" problems to analyze complex problems, each of which requires the identification of multiple applicable physical concepts (some of which will have been covered in prior chapters) and their use in an appropriate manner and sequence. Exams, homework problems and class discussions will be constructed to assure that students lacking this ability will be unable to earn better than a C in the course,
5. in all the subject areas covered in this course, display a grasp of the physical

adequate to analyze and discuss questions focused on an understanding of the application of the theories in particular situations rather than on the ability to perform calculations,

6. perform assigned experiments with reasonable are and competence, and to prepare adequate experimental reports presenting the numerical results and analyzing the sources and significance of errors, and
7. list and discuss objectives of any laboratory experiment, the type of measurements made, why they were made, and how they entered into the determination of the desired result.

Course Scope and Content:

Unit I Temperature and Expansion

Unit II Quantity of Heat

Unit III Heat Transfer

Unit IV Thermal Properties of Matter

Unit V The First Law of Thermodynamics

Unit VI The Second Law of Thermodynamics

Unit VII The Nature and Propagation of Light

Unit VIII Images Formed by a Single Surface

Unit IX Lenses and Optical Instruments

Unit X Interference and Diffraction

Unit XI Polarization

Unit XII Relativistic Mechanics

Unit XIII Photons, Electrons, and Atoms

Unit XIV Quantum Mechanics

Unit XV Atoms, Molecules, and Solids

Unit XVI Nuclear Physics

Learning Activities Required Outside of Class:

The students in this class will spend a minimum of 6 hours per week outside of the regular class time doing the following:

1. Studying
2. Completing required reading
3. Problem solving activity or exercise
4. Written work

Methods of Instruction:

1. Lectures, demonstrations, class discussions, and sample problems solved by the instructor with student involvement to illustrate the application of physical principles
2. Laboratory experiments. The principal objectives of the laboratory work are the demonstration of fundamental physical phenomena and the development of physical intuition based on hands-on experience with equipment in exploring these physical phenomena. High accuracy of measurements and development of sophisticated laboratory techniques are not emphasized, but the crucial role of experimental inquiry in the development of physical theory and in the refinement of our knowledge of physical constants and the behavior and properties of matter necessary as a foundation for technological progress are stressed.
3. Problem solving sessions under the direction of the instructor using whatever portion of laboratory time remains after performance of the experiments.
4. In both lecture and laboratory, emphasis will be placed on the development of an understanding of physical principles, and on the development of the thinking skills necessary to analyze increasingly complex problems and select an appropriate set and sequence of physical principles to solve them. Rote memorization of "format" approaches to solve typical exam problems will be avoided.
5. Maximum use will be made, where appropriate, of the student's developing mathematical capabilities to increase the generality and transparency of the physical presentations.

Methods of Evaluation:

1. Substantial writing assignments, including:
a. laboratory reports
b. brief expositions as part of exams
2. Computational or non-computational problem-solving demonstrations, including:
a. exams
b. homework problems