DE ANZA COLLEGE
PHYSICAL SCIENCE, MATHEMATICS, AND ENGINEERING DIVISION
COURSE OUTLINE

__X__ degree applicable

Physics 4C Fall 2005

I. Catalog Description

PHYSICS 4C Physics for Scientist and Engineers: Fluids, Waves, Optics, and Thermodynamics 6 units

Prerequisites: Physics 4B and Mathematics 1C
Corequisites: Mathematics 1D
Advisory: EWRT 100B and READ 91 or LART 100 or ESL 4

Five hours lecture; three hours laboratory.

Introductory studies in static and dynamic fluids, mechanical and non-mechanical waves, geometrical and physical optics, heat and the laws of thermodynamics.

II. Course Objectives

The student will:

A. in the lecture, apply the principles of physics to solve problems in:
   1. fluids.
   2. waves.
   3. optics.
   4. heat and thermodynamics.

B. In the laboratory demonstrate an ability to:
   1. maintain a legible, coherent and useful lab book utilizing extended written passages.
   2. take accurate measurements with confidence and understand the uncertainties associated with them.
   3. analyze data using graphical, statistical, and computer based techniques.
   4. analyze data to induce scientific conclusions
   5. collaborate with others as a team to produce collective results.

III. Essential Student Materials

Textbook, laboratory manual, and scientific calculator.

IV. Essential College Facilities

Physics laboratory

V. Expanded Description: Content and Form

A. In the lecture, the student will apply the principles of physics to solve problems in:
   1. fluids.
      a. density
      b. pressure
      c. Archimede's principle
      d. Bernoulli's equation
   2. waves.
      a. wave speed
      b. harmonic waves and their superposition
      c. standing waves
   3. optics.
      a. the nature of light
      b. geometrical optics
      c. optical instruments
      d. interference and diffraction
   4. heat and thermodynamics.
      a. temperature
      b. heat
      c. the first law of thermodynamics and energy
      d. the second law of thermodynamics and entropy

B. In the laboratory, the student will demonstrate an ability to:
   1. maintain a legible, coherent and useful lab book utilizing extended written passages.
      a. the structure of a lab book
      b. methods of keeping a useful lab book
   2. take accurate measurements with confidence and understand the uncertainties associated with them.
      a. absolute and relative uncertainties
      b. uncertainty propagation
      c. mean, standard deviation, and standard deviation of the mean
   3. analyze data using graphical, statistical, and computer based techniques.
      a. linear regression
      b. "linearizing" data to obtain linear plots
      c. spread-sheet style analysis of data and computer plots
   4. analyze data to induce scientific conclusions
      a. write meaningful conclusions based on observations, calculations, and data analysis
   5. learn to collaborate with others as a team to produce collective results.
      a. organize lab procedures as a team effort emulating the equivalent practices as found in industry and professional levels of research
      b. understand the ethics of the empirical scientific procedure as an attempt to report the reality of one's findings

VI. Assignments

A. Daily and weekly readings from the text, special articles, and class hand-outs
B. Weekly readings from the laboratory manuals
C. Weekly written assignments from the text and lectures
D. Written laboratory records during each week of lab

VII. Methods of Evaluating Objectives

A. Two or more one-hour examinations including questions requiring verbal answers.
B. Weekly quizzes based upon homework assignments and lecture
C. Laboratory quizzes and/or periodic review and critique of laboratory books
D. A laboratory-based final examination involving "hands-on" practical evaluations where possible and appropriate
E. A two-hour comprehensive lecture final that includes the testing of verbal and conceptual understanding as well as mathematical and computational competency with respect to the theoretical basis and problem solving aspects of the class.

VIII. Text and Supporting References

Texts:

* Tipler P., Physics, 5th edition, Worth, New York, 2004
Halliday, Resnick, and Krane, Physics, 4th edition, McGraw-Hill, New York, 1994
Halliday and Resnick, Physics, Classic Edition, 3rd edition, Wiley, 1976
Feynman, Leighton, and Sands, The Feynman Lectures on Physics, Addison-Wesley Publishing Company, Reading, Massachusetts.
Dickson, S., Physics 4C Laboratory Exercises, available on line at the physics web site
Newton, D., A Physics Lab Skills Manual, Kendall/Hunt, 1996

Journals/Periodicals:

Physics Today
The Physics Teacher
Scientific American
American Journal of Physics

Demonstration film loops available from the physics stockroom