



New Number and/or Full New Title

Course or Catalog Description Change

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Lesson One

# Syllabus of Record for PHYS 116

## I. Catalog Description

PHYS 116 Physics II for Electro-Optics

2 lecture hours

3 lab hours

3 credits

(2c-3l-3sh)

Prerequisite: PHYS 115

By applying Newton's Laws of Motion to atoms and molecules the student is introduced to the basic principles of and connections between temperature, heat, and molecular motion at a fundamental level. Concepts involved in fluid flow, electric charge, and the origin of magnetism will be covered. The fundamental basis for the existence of electric and magnetic fields and the generation of electromagnetic energy as waves will be explored. This course includes a lab

## II. Course Objectives

Upon successful completion of this course, the student will be able to:

1. Converse in the language of physics related to the motion of molecules and their relationship to temperature and heat.
2. Discuss the connections between the motion of charges and the existence of

B. Heat, Motion, and Temperature (3 hrs)

1. The Ideal Gas
2. The Temperature Scale
3. Heat and Energy
  - a. Thermal Expansion
  - b. Conduction of Heat
  - c. Specific Heat
  - d. Change of State

B. Thermodynamics (3 hrs)

1. The First Law of Thermodynamics
2. Heat Engines
3. The Second Law of Thermodynamics
4. Entropy

C. Electricity (4 hrs)

1. Force and Electric Charge
  - a. Electric Charge
  - b. Coulombs Law
  - c. Conservation of Charge
  - d. Conductors and Insulators
  
2. The Electric Field
  - a. Electric Field Lines
  - b. Electric Flux, Gauss' Law
  - c. Conductors in an Electric Field

2. Electrostatic Potential and Electric Potential Energy

- b. Equipotential Lines and Surfaces
- c. Energy of a System of Point Charges
- d. Capacitance and Capacitors

D. Charge Motion and Ohm's Law (4 hrs)

- F. Electromagnetic Induction (3 hrs)
  - 1. Motional Electromotive Force
  - 2. Faraday's and Lenz's Laws
  - 3. Inductance and Inductors
  - 4. Transformers
  - 5. Energy Stored in a Magnetic Field
  
- G. Electromagnetic Energy and Waves (2 hrs)
  - 1. Induction of Magnetic Fields and Maxwell's Equations
  - 2. The Electromagnetic Wave, its Origin, and the Speed of Light
  - 3. Plane Electromagnetic Waves and Polarization
  - 4. Energy of Electromagnetic Waves

Testing (2 hrs)

### III-B. Course Outline for Labs (14 labs, 3 hours per lab)

- A. Introduction (1 lab)
- B. Review of Measurement, Error and Graphing (1 lab)
- C. Archimedes' and Pascal's Principles (1.5 labs)
- D. Fluid Flow and the Exponential Process (1.5 labs)
- F. Thermal Expansion and Specific Heat Capacity (2 labs)

- F. The Electric Field and Electric Potential (1.5 labs)
- G. Ohm's Law and Resistance Combinations (1.5 labs)
- H. The Charging and Discharging of a Capacitor (1 lab)
- I. The Wheatstone Bridge and Potentiometer Null Methods of Measurement

Attendance Policy: The attendance policy will conform to the University wide attendance criteria.

**V. Required textbooks, supplemental books and readings**

Textbook: Hecht E., *Physics: Algebra/Trig, 2<sup>nd</sup>*, Brooks/Cole, 1998

Supplemental Readings:

1. *The Physics Teacher* (Journal published by the American Association of

Physics Teachers)

2. Handouts

**VI. Special resource requirements**

**VII. Bibliography**

1. Beiser, A., *Modern Technical Physics, 6<sup>th</sup> Ed.*, Addison Wesley, 1992
2. Cole, R., *So You Want to Take Physics*, Saunders College Publishing, 1993
3. Coletta, V. P, *College Physics*, Mosby Year-Book, Inc., 1995
4. Katz-Stone, D. M. and Hubbard, K. A., *The Physics Toolbox*, McGraw Hill, 1998
5. McDermott, L. C., Shaffer, P. and the Physics Education Group, *Tutorials in Introductory Physics*, Prentice Hall, 1998
6. Ohanian, W., *Principles of Physics*, W. Norton & Co., 1994
7. Pickar, A. D., *Preparing for General Physics*, Addison Wesley Publishing Co., 1992
8. Romine, G.S., *Applied Physics: Concepts into Practice, 1<sup>st</sup> Ed.*, Prentice-Hall, 2001
9. Serway, *Principles of Physics, 2nd*, Saunders College Publishing, 1998
10. Wilson, J.D. and Buffa, A.J., *College Physics, 4<sup>th</sup> Ed.*, Prentice-Hall Academic, 1999.

# Course Analysis Questionnaire

## PHYS 116, Physics II for Electro-Optics

### Section A: Details of the Course

A1 This course is a requirement for the proposed degrees Associate in Applied Science in Electro-Optics (A.A.S.E.O.) and Associate in Science in Electro-Optics (A.S.E.O.). This course is not intended for inclusion in the Liberal Studies program.

A2 This course does not require changes in any other courses in the department. The

**Section B: Interdisciplinary Implications**

- B1 This course will be taught by one instructor.
- B2 PHYS 116, Physics II, does not overlap any course taught in other departments.
- B3 Seats will be available in this course for students in the School of Continuing Education.

**Section C: Implementation**

- C1 The faculty resources are not adequate. In order to teach PHYS 116 for the Electro-Optics program, there is a need for 0.208 FTE. (For the source of this faculty resource see pg. 22 of "SLEP Requirements for New Programs")

- C2 Other Resources

**a. Space**

It is anticipated that a new building will be constructed at the North Pointe (Slate Lick) site before this program starts in the Fall of 2002. This building will house the Electro-Optics program. Since this course will be taught for the first time in the Fall of 2002, there should be no problem with space.

**b. Equipment**

In order to implement this course, we will need approximately \$35,000 in the first year for hardware and software

