

Blinn College

Master Course Syllabus

Physics 1402 – College Physics II

CIP # 40.0801.5103

CIP Area: Physical Sciences

Fall, 2005

Prepared by:

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Bryan Campus / Date

Confirmed by:

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Vice President Academic Affairs / Date

## PHYS 1402 – College Physics II

This course is in the core curriculum

### **PURPOSE STATEMENT**

The purpose of the physics component in the core curriculum is to enable the student to understand the basic concepts of classical physics and to apply that understanding to the analysis of current issues in society.

### **COURSE DESCRIPTION**

A continuation of Physics 1401. Topics covered include fundamentals of electricity, magnetism, light and some modern physics. **Prerequisites:** Physics 1401. Three class hours and three laboratory hours per week. **Credit:** four semester hours.

The expanded course description is:

#### A. ELECTROMAGNETISM

- 1) Electric Charge, Coulomb's Law and the Electric Field
- 2) Voltage, Electric Potential Energy and Capacitance
- 3) Current, Resistance and DC Circuits.
- 4) Magnetism
- 5) Faraday's Law and Inductance
- 6) AC Circuits
- 7) Electromagnetic Waves

#### B. OPTICS

- 1) Reflection and Refraction
- 2) Spherical Mirrors and Thin Lenses
- 3) Interference and Diffraction

#### C. MODERN PHYSICS (will cover two of the four topics)

- 1) Relativity
- 2) Quantum Physics
- 3) Atomic Physics
- 4) Nuclear Physics and Radiation

This is a Core Course in the 42-hour Core of Blinn College; more can be found at [www.blinn.edu/corecurriculum/](http://www.blinn.edu/corecurriculum/). As such, students will develop proficiency in the following :

#### A. INTELLECTUAL COMPETENCIES

- 1) Critical Thinking: The ability to think and analyze at a critical level.

- 2) Computer Literacy: The ability to understand our technological society, use computer-based technology in communication, solving problems, acquiring information.

#### B. EXEMPLARY EDUCATIONAL OBJECTIVES

- 1) To understand and apply method and appropriate technology to the study of the natural sciences.
- 2) To recognize scientific and quantitative methods and the differences between these approaches and other methods of inquiry and to communicate findings, analyses, and interpretation both orally and in writing.
- 3) To identify and recognize the differences among competing scientific theories.
- 4) To demonstrate knowledge of the major issues and problems facing modern science, including issues that touch upon ethics, values, and public policies.
- 5) To demonstrate knowledge of the interdependence of science and technology and their influence on, and contribution to, modern culture.

#### C. CURRICULUM PERSPECTIVES

- 1) Develop a capacity to use knowledge of how technology and science affect their lives.
- 2) Use logical reasoning in problem solving.
- 3) Integrate knowledge and understand the interrelationship of the scholarly disciplines.

### **COURSE OBJECTIVES AND STUDENT LEARNING OUTCOMES**

Upon completing this course students should have a grasp of the listed concepts and be able to solve problems using algebra, basic trigonometry and these physics concepts. Lecture and laboratory work will focus on the following learning outcomes:

Be able to define electric charge, insulators, conductors, electric forces, and electric field. Understand and be able to use Coulomb's law and equation representing electric field in solving problems in physics.

Be able to define electric potential energy and electric potential. Understand the principle of conservation of energy and equal potential surface.

Be able to calculate the capacitance and energy stored in a parallel-plate capacitor. Understand the behavior of RC circuits

Understand electric current, resistance and Ohm's law. Use Ohm's law and Kirchoff's rules in solving problems for different circuit combinations.

Understand and be able to describe magnetic field, magnetic force on moving charges and magnetic force exerted on current-carrying wires.

Be able to use the equations that are a result of Ampere's law to calculate the magnet fields in cases with a high degree of symmetry, such as, long current carrying wire, current carrying loop and a solenoid.

Know the relationship between the change in magnetic flux and induced electromotive force, Faraday's law of induction

Be able to use Lenz's law to determine the direction of an induced current.

Be able to calculate the self-inductance and energy stored in a current carrying solenoid. Understand the behavior of a RL circuit, and be able to calculate the energy stored in the magnetic field of the inductor.

Understand the behavior of resistors, capacitors and inductors in alternating currents circuits, and the relationship of these to the concept of resonance.

Be able to calculate voltage, impedance, current and phase angle for an RLC circuit.

Be able to calculate the energy density, intensity and radiation pressure of an electromagnetic wave.

Understand the concepts of law of reflection and law of refraction of light; and use the mirror equation and thin-lens equations to calculate image location and magnification.

Use physical optics concepts, interference and diffraction, to describe several optical phenomena.

Be able to discuss several modern physics topics.

Overall objectives for the course include the following:

- The student will maintain grade of **D** (60%) for completion of the course. This grade will include both lecture and laboratory components.
- The student will develop improved problem-solving skills.
- The student will develop an enhanced appreciation for the integration of physics and math and improved skill in interpreting the physical meaning of mathematical equations, which occur naturally in the course.

Laboratory work will be chosen to reinforce the above lecture topics. The student will demonstrate in the laboratory an understanding of the experiment through writing a report that analyzes the data and interprets the results.

## **COURSE REQUIREMENTS**

This physics course is a survey of the fundamental concepts of physics as listed above. Therefore, all topics in the basic course material should be presented and discussed, along with available supporting laboratory exercises.

## **GRADING SYSTEM**

Three or more major exams covering the lecture material will be given.

A minimum of eight (8) laboratory reports will be completed, per student.

A comprehensive final exam (given during the scheduled periods for final exams) will be given.

Quizzes and/or additional projects may be assigned, as the instructor deems necessary. These projects will be stated in the instructor's course information sheet provided to the students on the first day of class.

## **OUTCOMES INVENTORY**

Methods used to evaluate the effectiveness of this course:

1. Comparison of pre-test and post-test scores. A class average post-test grade of double the class average pre-test grade would be minimum improvement.
2. A 70% success rate [grade of C or better] of students finishing the course. A success rate of 55% would seem excessively low.
3. Less than a 30% withdrawal rate of students from the course, based on the 12<sup>th</sup> day class roll.
4. Student evaluation and comments on the effectiveness of the course.
5. Each Intellectual Competency listed above will be evaluated to measure its attainment:
  - a. To measure critical thinking:  
Pre- and post-test or written assignment or exam or quiz involving problem solving.
  - b. To measure computer literacy:
    1. Laboratory reports or quiz over data taking and analysis by using computer AND/OR
    2. Lab assignments or quiz involving internet/compute simulations.
    - 3.

## **CALENDAR**

The instructor will ensure that the course content is covered in a manner that fulfills the course objectives. The instructor will also provide a Course Information Sheet [ per college mandated guide lines] to the students and the administration during the first week of the semester, or the first two days of a summer session. Important details including tentative examination dates and due dates for major assignments must be provided.

The following is an approximate time-line for the introduction of various topics within the course during a full semester:

- 1) Electric Charges, Forces, and Fields – 1.5 weeks
- 2) Electric Potential and Electric Potential Energy – 1.5 weeks
- 3) Electric Current and DC Circuits – 2 weeks
- 4) Alternating-Current Circuits – 1.5 weeks
- 5) Magnetism and Faraday's Law of Induction – 2.5 weeks
- 7) Geometrical Optics and Optical Instruments – 1.5 weeks
- 8) Interference and Diffraction – 1 week
- 9) Electromagnetic Waves – 0.5 week
- 10) Two Modern Physics Topics – 2 weeks

## **MATERIALS REQUIRED**

### TEXTBOOK:

Bryan and Brenham campus: James S. Walker: PHYSICS, First Edition., Prentice- Hall, Inc., Upper Saddle River, New Jersey, 2002.

### LABORATORY MANUAL:

Bryan campus: none required

Brenham campus: J.D. Wilson: Physics Laboratory Experiments, 5<sup>th</sup> ed., D.C. Heath and Company, Lexington, MA

## **OPTIONAL MATERIALS**

Bryan campus: any scientific calculator

Brenham campus: scientific calculator – neither graphing nor programmable; prefer one-line display.