Blinn College

Master Course Syllabus

Physics 1401 – College Physics I

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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PHYS 1401 – College Physics I
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 course primarily designed for students preparing for careers in architecture, biology, medicine, pharmacy and other fields requiring two semesters of physics. Topics covered include fundamentals of classical mechanics, heat and sound. **Prerequisites:** two years of high school algebra with grades of 'C' or better or Math 1314. Three class hours and three laboratory hours per week. **Credit:** four semester hours.

The expanded course description is:

A. MECHANICS

1) Vector Analysis
2) One- and Two-Dimensional Kinematics
3) Force
4) Work and Energy
5) Impulse and Momentum
6) Rotational Kinematics and Dynamics
7) Harmonics
8) Gravity
9) Fluids (optional)

B. THERMODYNAMICS

1) Temperature and Heat
2) Ideal Gas Law
3) Kinetic Theory of Gases
4) First and Second Laws of Thermodynamics
5) Entropy

C. WAVE MOTION AND SOUND

This is a Core Course in the 42-hour Core of Blinn College; more can be found at 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 interrelationships 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 displacement, velocity and acceleration in words, symbols and graphically.
- Be able to use vectors in solving problems in physics.
- Be able to define work and mechanical energy. Understand the work-energy theorem, the definition of potential energy and the principle of conservation of mechanical energy.
- Understand and describe uniform circular motion.
- Distinguish clearly between elastic and inelastic collisions and understand the concepts of impulse and momentum.

- Know what angular velocity and angular acceleration are. Understand rotational dynamics.
- Understand the conditions for static equilibrium and be able to locate the center of mass of a system of particles.
- Understand the zeroth, first and second laws of thermodynamics.
- Distinguish between heat, temperature, and specific heat. Use these quantities in solving problems involving calorimetry.
- Understand the basic principles of the heat engine and refrigerator. Be able to discuss the concept of entropy. Be able to calculate the entropy change for reversible processes.
- Be able to express a given harmonic function in several alternative forms involving different combinations of the wave parameters: wavelength, period, wave number, angular frequency and harmonic frequency.
- Understand various properties of sound waves.
- Identify the angular frequency and maximum amplitude of a standing wave, given an expression for the wave displacement as a function of time.

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.

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 12th 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
        2. Lab assignments or quiz involving internet/computer simulations.

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 timeline for the introduction of various topics within the course during a full semester:

A. MECHANICS

TOPIC	NUMBER OF WEEKS
1) Vector Analysis	1
2) One- and Two-Dimensional Kinematics	2
3) Force	2
4) Work and Energy	1.5
5) Impulse and Momentum	1.5
6) Rotational Kinematics and Dynamics	1
7) Harmonics	1
8) Gravity	1
9) Fluids (optional)	

B. THERMODYNAMICS (2 to 3 weeks total)

TOPICS
10) Temperature and Heat
11) Ideal Gas Law
12) Kinetic Theory of Gases
13) First and Second Laws of Thermodynamics
14) Entropy

C. WAVE MOTION AND SOUND (one week)

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, 5th 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.