Blinn College

Master Course Syllabus

Physics 2425

CIP # 40.0801.5403

CIP Area: Physical Sciences

Fall, 2005

Prepared by:

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Bryan Campus / Date

Confirmed by:

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Division Chair, Brenham Campus / Date

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Division Chair, Bryan Campus / Date

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Brenham Academic Dean / Date

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Bryan Academic Dean / Date

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Vice President Academic Affairs / Date

PHYS 2425 – Physics for Engineers 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 majoring in engineering and physical sciences. Topics include classical mechanics, heat and waves. **Prerequisites:** Math 2413 or continuing concurrent enrollment therein. Three class hours and three laboratory hours per week. **Credit:** four semester hours.

The basic material covered in the course 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
   7) Law of Gravity
   8) Fluids (optional)

B. WAVES
   1) Harmonics
   2) Wave Motion
   3) Sound

C. THERMODYNAMICS
   1) Temperature and Heat
   2) Ideal Gas Law (optional)
   3) Kinetic Theory of Gases (optional)
   4) First and Second Laws of Thermodynamics

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 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 calculus 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 (using calculus) and graphically. From the definitions of velocity and acceleration, be able to derive the equations which describe the motion of a particle with constant acceleration in one and two dimensions.

Understand and be able to use vector analysis 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 be able to describe both uniform and non-uniform circular motion.

Understand the concepts of impulse and momentum, the principle of conservation of linear momentum and the distinction between elastic and inelastic collisions

Understand and be able to describe the bulk motion of a system of particles and the definition of the center of mass.

Understand the concepts of rotational kinematics.

Understand rotational dynamics, specifically torque, angular momentum and its conservation, and the rotational form of the second law of motion.

Understand the conditions for static equilibrium.

Understand the zeroth law of thermodynamics, temperature and temperature scales.

Understand heat, thermodynamic work, first and second laws of thermodynamics and entropy.

Understand the basics of wave motion, including a description of harmonic waves. Understand the examples of waves on a string, sound waves and standing waves.

Laboratory work will be chosen to re-enforce 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.

By the end of the course the student will maintain a minimum grade of **D** (60%) for completion of the course. This grade will include both lecture and laboratory components.

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 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:
        1. 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/compute 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 time-line for the introduction of various topics within the course during a full semester:

1) Vector Analysis and Kinematics (one and two dimensional) – 2 weeks
2) Force – 2 weeks
3) Work and Energy – 2 weeks
4) Impulse and Momentum – 1 week
5) Rotational Kinematics and Dynamics – 1.5 week
6) Law of Gravity – 1 week
7) Harmonics, Waves and Sound – 2 week
8) Temperature – 0.5 weeks
9) Ideal Gas Law and Kinetic Theory of Gases (optional – 1 week)
10) Heat and the First Law of Thermodynamics – 1 week
11) Entropy and the Second Law of Thermodynamics – 1 week

MATERIALS

TEXTBOOK:

Bryan and Brenham campus: R.A. Serway and R.J. Beicher: PHYSICS: For Scientists and Engineers, 5th ed., Saunders College Publishing, Fort Worth, TX 2000.

LABORATORY MANUAL:

Bryan campus: none required
Brenham campus: J.D. Wilson: Physics Laboratory Experiments, 5th ed., D.C. Heath and Company, Lexington, MA

OPTIONAL MATERIAL:

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