PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

NONCALCULUS BASED PHYSICS I
PHYS 2010

Class Hours: 3.0
Laboratory Hours: 3.0
Credit Hours: 4.0
Date Revised: Spring 03

Catalog Course Description:

This course includes the basic principles of physics with their applications in pre-medical, -dental, -pharmacy, and -veterinary programs and covers mechanics, heat, and wave motion including sound. Course includes 3 hours of lecture and 3 hours of laboratory applications.

Entry Level Standards:

Students registering for this course must have recently finished a pre-calculus course and have a good background in trigonometry.

Prerequisites:

MATH 1730 or MATH 1130 & 1720

Textbook(s) and Other Reference Materials Basic to the Course:

Pellissippi State Lab Manual for Physics 1310/2010

I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Lecture: 1.1 thru 1.3, System of Units</td>
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<td></td>
<td>1.5 Scalars and Vectors</td>
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<td></td>
<td>1.6 Vector Addition and Subtraction</td>
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<td>1.7 Vector Components</td>
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<td>1.8 Vector Addition by Use of Components</td>
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<td></td>
<td>Lab: Ch. 1 group problems session</td>
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<tr>
<td>2</td>
<td>Lecture: 2.1 Displacement</td>
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<td></td>
<td>2.2 Speed and Velocity;</td>
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<td>2.3 Acceleration;</td>
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<td>2.4 Kinetics Equations</td>
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<td>2.5 Applications of 2.4</td>
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<td>2.6 Freely Falling Bodies</td>
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Test 1
Lab: Group experiment 1: Density Measurement, (Exp. 2 in the Lab Manual) Also, Chapter 2, group problems session
Lecture: 3.1 2-D Displacement, Vel. & Accel.
3.2 Equations of Kinematics in 2-D
3.3 Projectile Motion
3.4 Relative Velocity
Lab: Group Experiment 2: Measurement of the Acceleration of Gravity (g), (Exp. 4 in Lab Manual) Ch. 3 group problems session

Lecture: 4.1 The Concept of Force and Mass
4.2 Newton's 1st Law of Motion
4.3 Newton's 2nd Law of Motion
4.4 The Vector Nature of 2nd Law
4.5 Newton's 3rd Law of Motion

Test 2
Lab: Group Experiment 3: Experimental Addition of Vectors by Using a Force Table, (Exp. 5 in Lab Manual), Ch. 4 group problems session

Lecture: 4.7 and 4.8: The Gravit. & Normal Forces
4.9 Frictional Force
4.10 The Tension Force
4.11 and 4.12: Equilibrium of Forces
Lab: Ch. 4 group problems session

Lecture: 5.1 Uniform Circular Motion
5.2 Centripetal Acceleration
5.3 Centripetal Force
5.4 Banked Curves
5.5 Satellites in Circular Orbits
5.6 Vertical Circular Motion
5.6 Power, Chapter Review.

Test 3
Lab: Group Experiment 4: Newton's 2nd Law (Exp. 6 in Lab Manual), Ch. 4 and Ch. 5 group problems session

Lecture: 6.1 Work Done by a Constant Force
6.2 The Work-Energy Theorem and K.E.
6.3 Gravitational Potential Energy
6.5 The Conserv. of Mechanical Energy
6.7 Power
6.9 Work done by a variable force
Lab: Group Experiment 5: Coefficient of Friction (Exp. 10 in Lab Manual), Ch.6 group problems session

Lecture: 7.1 The Impulse-Momentum Theorem
7.2 Conservation of Linear Momentum
7.3 Collision in One Dimension

Test 4
Lab: Group Experiment 6: Conservation of Energy (Exp. 11 in Lab Manual), Ch. 7 group problems session

Lecture: 8.1 Angular Displacement
8.2 Angular Velocity and Acceleration
8.3 Rotational Kinematics
8.4 Angular and Tangential Variables
8.5 Centripetal and Tangential Accel.
8.6 Rolling Motion
Lab: Group Experiment 7: Centripetal Force (Exp. 9 in Lab Manual), Ch.8 group problems session

10 Lecture: 9.1 Torque Concept
9.4 2nd Law for Rotation about an Axis

Test 5
Lab: Ch.9 group problems session

11 Lecture: 10.3 Simple Harmonic Motion(SHM)
10.4 SHM and the Reference Circle
Lab: Ch.10 group prob. session

12 Lecture: 11.1 Mass Density
11.2 Pressure
11.3 Pressure and Depth in Static Fluids
11.5 Pascal's Principle
11.6 Archimedes' Principle
Test 6
Lab: Ch. 11 group prob. session

13 Lecture: 12.1-3 Temp. Scales & Thermometers
12.4-5 Thermal Expansion
12.6 Heat and Internal Energy
12.7 Heat and Temperature Change
12.8 Heat and Phase Change
Lab: Group Experiment 8: Archimedes' Principle, Specific Gravity Measurement. (Exp. 22 in Lab Manual), Ch. 12 group prob. session

14 Lecture: 14.1 The Mole Concept & Avogadro's No.
14.2 The Ideal Gas Law
14.4 Kinetic Theory of Gases

Test 7
Lab: Group Experiment 9: Specific Heat Measurement (Exp. 19 in Lab Manual), Ch. 14 group prob. session

15 Lecture: 16.1 The Nature of Waves
16.2 Periodic Waves
16.3 The Speed of a Wave on a String
16.4 Equation of a Wave
16.5 The Nature of Sound
16.6 The Speed of Sound
16.10 The Doppler Effect
Test 5. 20-30 minutes
Lab: Group Experiment 10: Speed of Sound Air Column Resonance (Exp. 17 in Lab Manual)

16 COMPREHENSIVE FINAL EXAM (110 minutes)

II. Course Objectives*:

A. Explain Metric and American units and systems and perform various conversions between
the two, (The gauges at work sites often use both types of units). I.5, VI.2

B. Qualitatively describe the motion of a body, quantitatively calculate the necessary parameters by using equations of motion, and gather and interpret data in a laboratory setting to measure motion and acceleration of a moving object. VI.2-5

C. Quantitatively analyze force-motion relations in a lab setting as well as a real life situation by using Newton's Laws of Motion. I.5, VI.2

D. Calculate the work done by a force analytically and measure it experimentally as well as energy calculations and conversion of work to heat (calories). I.5, VI.1-5

E. Experiment with and explain different forms of energy and their conversion to each other as well as the Principle of Conservation of Energy in a laboratory setting. I.5

F. Apply the laws of conservation of energy and momentum. I.5

G. Quantitatively calculate the parameters involved in the motion of a rotating object such as particle separators (centrifugal separating devices). VI.1-5

H. Quantitatively apply the laws of fluid pressure and density to measure the necessary parameters in a practical situation at work. VI.1-5

I. Make temperature measurements in different scales and convert and use them for specific heat experiment and energy calculations with or without phase change. I.5

J. Experimentally measure the coefficient of thermal expansion of solids, and quantitatively calculate those of liquids, and gases by using their appropriate equation. I.5

K. Quantitatively and experimentally assess oscillatory motion by measuring wavelength, amplitude, and the phase of motion of mechanical waves such as sound. I.5

L. Experimentally apply the conditions of static equilibrium to find the forces acting on an object in a given situation. I.5

N. Experimentally apply the torque concept to analyze the static equilibrium of a rigid body. I.5

O. Search for the solution to the assigned projects by examining the available software and resources. VII

*Roman numerals after course objectives reference goals of the university parallel program.

III. Instructional Processes*:

Students will:

1. learn in a cooperative mode by working in small groups with other students and exchanging ideas within each group (or sometimes collectively) while being coached by the instructor who provides assistance when needed (Communication Outcome, Problem Solving and Decision Making Outcome, Active Learning Strategy),

2. learn by being a problem solver rather than being lectured (Problem Solving and Decision Making Outcome, Active Learning Strategy),

3. explore and seek solutions to given problems that measures his/her level of accomplishment (Problem Solving and Decision Making Outcome, Active Learning Strategy),
4. visit industry sites or will be visited by a person from industry who applies the concepts being learned at his/her work site (Transitional Strategy),

5. gradually be given higher- and higher-level problems to promote his/her critical thinking ability (Problem Solving and Decision Making Outcome, Personal Development Outcome),

6. be tested more frequently for progress assessment while working independently on test problems (Problem Solving and Decision Making Outcome),

7. get engaged in learning processes such as projects, mentoring, apprenticeships, and/or research activities as time allows (Communication Outcome, Transitional Strategy),

8. be repeatedly given a review on the previous topics to enable him/her to see that physics is the science of equilibrium and how each physics phenomenon can be viewed from an equilibrium point of view (Problem Solving and Decision Making Outcome, Personal Development Outcome),

9. understand physics and recognize matter in all phenomena (even those that do not seem to be physical at the first glance) and analyze them to the extent of their physics knowledge in light of equilibrium (especially, the Law of conservation of mass and energy), and see how thinking in terms of equilibrium and equality can bring harmony to mankind (Problem Solving and Decision Making Outcome, Personal Development Outcome), and

10. use computers with appropriate software during class or lab as a boost to the learning process (Information Literacy Outcome, Technological Literacy Outcome).

*Strategies and outcomes listed after instructional processes reference Pellissippi State’s goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

IV. Expectations for Student Performance*:

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

1. prepare a laboratory report on each experiment and explain a scientific conclusion based on the experimental results,

2. discuss the undesirable results in all reports (where appropriate) to become proficient in expressing scientific arguments as opposed to non-biased reasoning,

3. identify the use of equipment and machines from the units used in their gauges (A),

4. master energy calculations to estimate energy requirement and feasibility in a given situation (D, E, and F),

5. perform necessary conversions between Metric and non-metric units and systems (A),

6. apply the kinematics equations to describe motion (B and C),

7. apply the kinetics equation in force-motion situations (B and C),

8. calculate the work done, energy involved, and energy conversions in a given problem (D, E, and F),

9. solve problems involving circular motion as well as torque, energy, and momentum calculations (E, F, and G),
10. solve temperature and heat problems with or without phase change (I),
11. solve problems involving heat effect and thermal expansion in solids, fluids, and gases (J),
12. solve oscillatory motion problems in order to find the parameters involved (K and L),
13. solve and analyze fluid pressure, air pressure, and density problems (H),
14. apply a vector approach where vector quantities are involved (M),
15. resolve a vector into two components graphically and analytically (M), and
16. apply force and torque equilibrium concepts in solving rigid-body problems (M and N).

*Letters after performance expectations reference the course objectives listed above.

V. Evaluation:

A. Testing Procedures:

Students are primarily evaluated on the basis of test/quiz type assessments and homework as outlined on the syllabus supplement distributed by the instructor. The following formula is used to evaluate the course grade:

Course Grade = (0.75) x (Theory Grade) + (0.25) x (Lab Grade)

Theory Grade = 0.80 (Tests + Quizzes + H.W.) + 0.20 (Comprehensive Final)

(80%) (10%) (10%)

The number of tests vary from 5 to 7 at the discretion of instructor. The quizzes and homework percentages may vary depending on the instructor.

B. Laboratory Expectations:

Ten experiments are designed for the course. Each experiment requires a word-processed report which must be at least spell-checked. Other procedures for a standard lab report will be given by your instructor. No late lab report will be accepted and there are NO lab make-ups.

Lab Grade = (the sum of report grades) / (the number of the reports)

C. Field Work:

Site Visits: The necessary site visits will be announced as the arrangements are made. Evaluation will be based on attendance as well as the visit report.

D. Other Evaluation Methods:

N/A

E. Grading Scale:

91-100 : A  77-81 : C+
87-91 : B+  70-77 : C
81-87 : B   60-70 : D

VI. Policies:
Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course.