PELLISSIPPI STATE COMMUNITY COLLEGE
MASTER SYLLABUS

NONCALCULUS BASED PHYSICS I
PHYS 2010

Class Hours: 3.0  Credit Hours: 4.0
Laboratory Hours: 3.0  Revised: Spring 2011

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 three hours of lecture and three 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 Course Materials:

Physics 2010 Lab Manual

I. Week/Unit/Topic Basis:

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

4
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 Force Table
4.4 The Vector Nature of 2nd Law
4.5 Newton's 3rd Law of Motion
Lab: Group Experiment 3: Vector Addition Equilibrium of Concurrent Forces (The Force Table)

5
Lecture: 4.7 and 4.8: The Gravity & Normal Forces
4.9 Frictional Force
4.10 The Tension Force
4.11 and 4.12: Equilibrium of Forces

Test 2
Lab: Group Experiment 4: The Acceleration of Gravity, Measurement of "g"

6
Lecture: 5.1 Uniform Circular Motion
5.2 Centripetal Acceleration
5.3 Centripetal Force
5.4 Motion of a Car along Banked and Unbanked Roads
5.5 Satellites in Circular Orbits
5.6 Vertical Circular Motion

Test 3
Lab: Group Experiment 5: Coefficient of Friction

7
Lecture: 6.1 Work Done by a Constant Force
6.2 The Work-Energy Theorem and K.E.
6.3 Gravitational Potential Energy
6.4 Work-Energy Theorem
6.5 The Conservation of Mechanical Energy
6.7 Power
6.9 Work done by a variable force
Lab: Group Experiment 6: Newton's Second Law

8
Lecture: 7.1 The Impulse-Momentum Theorem
7.2 Conservation of Linear Momentum
7.3 Collision in One Dimension

Test 4
Lab: Group Experiment 7: Conservation of Energy

9
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.
9.1 Torque Concept
9.2 Rigid Objects in Equilibrium

Lab: Group Experiment 8: Centripetal Force
10 Lecture: 9.3 Center of Gravity
9.4 2nd Law for Rotation about an Axis
9.5 Rotational Work and Energy
10.1 Simple Harmonic Motion (S H M)
10.2 S H M and the Reference Circle

Test 5
Lab: Ch.9 Problems session; Ch. 10 Problems session

11 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 Problems session

12 Lecture: 12.1-3 Temp. Scales & Thermometers
12.4-5 Thermal Expansion
12.6 Heat and Internal Energy
12.7 Heat and Temperature Change Measurement
12.8 Heat and Phase Change
Lab: Group Experiment 9: Archimedes' Principle, Specific Gravity

13 Lecture: 14.1 The Mole Concept & Avogadro's Number
14.2 The Ideal Gas Law
14.3 Kinetic Theory of Gases

Test 7
Lab: Group Experiment 10: Specific Heat Measurement

14 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
Lab: Group Experiment 11: Speed of Sound (Air Column Resonance)

15 FINAL EXAM (Comprehensive)

II. Course Goals*:
The goal of this course is to familiarize students with the principles of physics as the basis for their
continuation of studies in Science and Medical profession. At work sites, the graduates often need to
work with devices that operate by virtue of physics principles. Examples are traction equipment, X-ray machines, sonogram, blood pressure measurement devices, etc. The examples and problems
selected for the course give students the necessary knowledge and skills to read and analyze
scientific data with proper understanding of the units involved and the types of physical quantities
measured. The first few chapters lay down the foundation that is absolutely necessary to the
understanding of physical quantities that appear in later chapters and are often seen on equipment
used in medicine or industry. On this basis, after finishing this course, students will be able to:

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). V.1, V.3

B. Describe the motion of a body, calculate the necessary parameters by using equations of motion in a practical situation. V.1, V.4

C. Resolve a vector into its rectangular components. V.3

D. Analyze force-motion relations in a practical situation. V.1, V.4

E. Calculate the work done by a force as well as energy calculations and conversion to heat (calories). V.1, V.4

F. Explain different forms of energy and their conversion to each other as well as the Principle of Conservation of Energy. V.1, V.2, V.3, V.4

G. Apply the laws of conservation of energy and momentum. V.2, V.3, V.4

H. Calculate the parameters involved in the motion of a rotating object such as particle separators (centrifugal separating devices). V.2, V.4

I. Apply the laws of fluid pressure and density to measure the necessary parameters in a practical situation at work. V.1, V.3

J. Make temperature measurements in different scales and convert and use them for heat and energy calculations with or without phase change. V.3

K. Apply the equations for thermal expansion of solids, liquids, and gases. V.3

L. Describe oscillatory motion by measuring wavelength, amplitude, and the phase of motion of mechanical waves such as sound. V.1, V.3

M. Apply the knowledge of sound parameters such as frequency, wavelength, and in interpreting the signals on measurement devices in sonogram and ultrasound V.3

N. Apply the conditions of static equilibrium to find the forces acting on an object in a given situation. V.1, V.3

O. Use the concept of torque of a force to analyze the static equilibrium of a rigid body. V.3

* Roman numerals after course goals reference the stipulated outcomes of Natural Science programs under General Education Goals.

III. Expected Student Learning Outcomes*:

The student will be able to:

1. Apply the physics concepts to theoretical and practical situations. A-K

2. Estimate an unknown parameter in a given practical situation by using the physics principles involved. B, D, E, F, G, H, I

3. Recognize and 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, F
5. Perform necessary conversions between Metric and non-metric units and systems. A
6. Apply the kinematics equations to describe motion. B, C
7. Apply the kinetics equation in force-motion situations. B, C
8. Calculate the work done, energy involved, and energy conversions in a given problem. D, E, F
9. Solve problems involving circular motion as well as torque, energy, and momentum calculations. E, F, 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, 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
16. Apply force and torque equilibrium concepts in solving rigid-body problems. M, N, O

* Capital letters after Expected Student Learning Outcomes reference the course goals listed above.

IV. 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:

\[
\text{Course Grade} = (0.75 \times \text{Theory Grade}) + (0.25 \times \text{Lab Grade})
\]

**For Campus-based Students:**

\[
\text{Theory Grade} = 0.80(\text{Tests+Quizzes + H.W.}) + 0.20(\text{Comprehensive Final})
\]

The number of tests may vary from 4 to 7. The percentages given for tests, quizzes, and homework may vary depending on the instructor. Final Exam must be taken during the Final Exam Week. No early Final Exam will be given.

**For Online Students:**

\[
\text{Theory Grade} = 0.70(\text{Tests Mean}) + 0.30(\text{Comprehensive In-class Final})
\]

There will be an online chapter test each week. Final Exam must be taken on campus.

B. Laboratory Expectations:

Eleven experiments* are designed for the course. Each experiment requires a report that must
be at least spell-checked. Procedures for a standard lab report will be given by your instructor. To avoid a ZERO Laboratory Grade, at least 6 reports must be turned in. No late lab report(s) 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), (87-91: B+), (81-87 : B), (77-81: C+), (70-77:C), and (60-70: D)

V. Policies:

A. Attendance Policy:

Pellissippi State expects students to attend all scheduled instructional activities. As a minimum, students in all courses (excluding distance learning courses) must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of the Learning Division, may have requirements that are more stringent. In very specific circumstances, an appeal of the policy may be addressed to the head of the department in which the course was taken. If further action is warranted, the appeal may be addressed to the vice president of the Learning Division.

B. Academic Dishonesty:

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices:

• Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
• Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
• Purchasing or otherwise obtaining prewritten essays, research papers, or materials prepared by another person or agency that sells term papers or other academic materials to be presented as one’s own work.
• Taking an exam for another student.
• Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.
• Any of the above occurring within the Web or distance learning environment.

C. Accommodations for disabilities:

Students who need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students
must present a current accommodation plan from a staff member in Services for Students with Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 127, 132, 134, 135, 131 or by phone: 539-7153 or TTY 694-6429. More information is available at www.pstcc.edu/departments/swd/.

D. Other

**Final Exam:** Final Exam must be taken during the Final Exam Week. No early Final Exam will be given.

**Lab Reports:** No late lab report will be accepted and there are No Lab Make-ups

* Experiments:
  1. Measurement and Density
  2. Addition of Vectors (Graphical Approach)
  3. Addition of Vectors (Force Table)
  4. Measurement of "g", The Acceleration of Gravity
  5. The Coefficient of Friction
  6. Newton’s Second Law
  7. Conservation of Energy
  8. Centripetal Force
  9. Archimedes' Principle
  10. Specific Heat Measurement
  11. Speed of Sound (Air Resonance Tube)