

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

NONCALCULUS BASED PHYSICS I
PHYS 2010

Class Hours: 3.0

Credit Hours: 4.0

Laboratory Hours: 3.0

Revised: Spring 05

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 Course Materials:

Physics by Cutnell & Johnson, 6th Edition, Wiley 2001.
Physics 2010 Lab Manual

I. Week/Unit/Topic Basis:

| Week | Topic |
|-------------|--|
| 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 Banked Curves
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 of Motion

- 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
 Lab: Group Experiment 10: Specific Heat Measurement
- 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 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). 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 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. *Active Learning Strategy*
2. learn by being a problem solver rather than being lectured. *Active Learning Strategy*
3. explore and seek solutions to given problems that measures his/her level of accomplishment. *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. *Active Learning Strategy*
6. search for the solution to the assigned projects by examining the available software and resources. *Transitional Strategy*
7. get engaged in learning processes such as projects, mentoring, apprenticeships, and/or

research activities as time allows. *Transitional Strategy*

8. use computers with appropriate software during class or lab as a boost to the learning process. *Technological Literacy Outcome*

*Strategies and outcomes listed after instructional processes reference TBR' 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. 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

*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:

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

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

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

The number of tests vary from 5 to 7. The percentages given for tests, quizzes, and homework may vary depending on the instructor.

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.

$$\text{Lab Grade} = (\text{the sum of report grades}) / (\text{the number of the reports})$$

C. Field Work:

Site Visits: The necessary site visits will be announced as the arrangements are made. Evaluation will be based on of 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:

A. 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. Individual departments/programs/disciplines, with the approval of the vice president of Academic and Student Affairs, may have requirements that are more stringent.

B. Academic Dishonesty:

Plagiarism, cheating, and other forms of academic dishonesty are prohibited. Students guilty of academic misconduct, either directly or indirectly through participation or assistance, are immediately responsible to the instructor of the class. In addition to other possible disciplinary sanctions which may be imposed through the regular Pellissippi State procedures as a result of academic misconduct, the instructor has the authority to assign an F or a zero for the exercise or examination or to assign an F in the course.

C. Accommodations for disabilities:

If you need accommodation because of a disability, if you have emergency medical information to share, or if you need special arrangements in case the building must be evacuated, please inform the instructor immediately. Privately after class or in the instructor's office.

To request accommodations students must register with Services for Students with Disabilities: Goins 127 or 131, Phone: (865) 539-7153 or (865) 694-6751 Voice/TDD.

D. Other

* Experiments:

- 1 Measurement and Density
- 2 Addition of Vectors (Graphical Approach)
- 3 Addition of Vectors (Force Table)
- 4 The Acceleration of Gravity
- 5 The Coefficient of Friction
- 6 Centripetal Force
- 7 Newton' s Second Law of Motion
- 8 Conservation of Energy
- 9 Archimedes' Principle
- 10 Specific Heat Measurement
- 11 Speed of Sound