PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

MECHANICS & HEAT W/ LAB I
PHY 1310

Class Hours: 3.0 **Credit Hours: 4.0**

Laboratory Hours: 3.0 **Date Revised: Spring 01**

Catalog Course Description:

A calculus-based introduction to mechanics and heat. This course covers vectors, Newton's laws of motion, static and dynamic equilibrium of particles, work and energy, impulse and momentum, torque and rotational equilibrium, and elasticity. Course includes 3 hours of lecture and 3 hours of laboratory applications.

Entry Level Standards:

Students registering for this course must have a strong background in calculus and trigonometry.

Prerequisite:

MTH 1410

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

University Physics, Models and Applications, by William P Crummett and Arthur B. Western
Physics Lab Experiments by Jerry D. Wilson, 5th edition

I. Week/Unit/Topic Basis:

Week	Topic
1	Lecture: Physics and Measurement (1.1 Physics and Models, 1.2 System of Units, Unit Conversion, 1.4 Unit Conversion) Lab: Density Measurement
2	Lecture: Vector Algebra (2.1 Coordinates Systems, 2.2 Scalars and Vectors,?2.3 Vector Addition, 2.4 Vector Multiplication) Lab: Vector Addition: Graphical Method & Force Table Method
3	Lecture: Motion Along a Straight Line (3.1 Position, Velocity, & Acceleration, 3.2 Graphical Interpretation of 3.1, 3.3 The Constant Acceleration Model) Test 1 Lab: Measurement of "g", Accel. Of Gravity
4	Lecture: Motion Along a Straight Line cont. (3.4 Calculus Application 3.5 Handling Real Data)
5	Lecture: Motion in Two Dimensions (4.1 Velocity and Acceleration Vectors, 4.2 Projectile Motion, 4.3 Circular Motion, 4.4 Numerical Methods in Two Dimensions) Lab: Use of Computers to Study Motion

6	Lecture: Forces: Newton's Three Laws of Motion (5.1 Newton's First Law: Inertia) Test 2 Lab: Newton'd 2nd Law
7	Lecture: Forces cont. (5.3 Some Common Forces, 5.4 Applications of Newton's 2nd Law, 5.5 Newton's Third Law, 5.6 Gravitational Field)
8	Lecture: Additional Force Models (6.1 The Coefficient-of-Friction Model, 6.2 Circular Motion) Lab: Coefficient of Friction
9	Lecture: Additional Force Models cont. (6.3 Newton's Universal Law of Gravity, 6.6 Numerical Methods for Newton's 2nd Law) Test 3 Lab: Centripetal Force
10	Lecture: Work and Kinetic Energy (7.1 Work(Const. Force, Const. Direction) 7.2 Work(Varia. Force, Const. Direction), 7.3 Work(Varia. Force, Varia. Direction, 7.4 Work and Kinetic Energy, 7.5 Power) Lab: Computer Application
11	Lecture: Conservation of Energy,(8.1 Conservative Forces and Pot. Energy, 8.2 Potential Energy, 8.3 Conservation of Mechanical Energy, 8.4 Systems with Non-conservative Forces, 8.5 Conservative Forces, 8.6 Pot. Energy for Newtonian Gravity) Test 4 Lab: Conservation of Energy
12	Lecture: Impulse and Linear Momentum (9.1 Impulse, 9.2 Impulse and Momentum, 9.3 The Momentum Statement of Newton's 2nd Law, 9.4 Conservation of Momentum)
13	Lecture: Impulse and linear Momemtum, cont. (9.5 Collisions in One Dimension, 9.6 Collisions in Two Dimension) Lab: Collision in One-Dim.
14	Lecture: Momentum, Energy and the Center of Mass (10.1 The Big Picture, 10.2 The Ballistic Pendulum, 10.3 The Center of Mass, 10.4 Center of Mass: Energy, Momentum, and Newton's 2nd Law, 10.5 Systems of Variable Mass) Test 5 Lab: Simple Pendulum
15	Lecture: Rotation About a Fixed Axis (11.1 Kinematics of Rotational Motion, 11.2 Kinetic Energy and Rotl. Inertia, 11.3 Torque, 11.4 Newton's 2nd Law for Rotation about a Fixed Axis, 11.5 Angular Mom. for Rot. Motion) Lab: Group Problems Session
16	Final Exam

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 and quantitatively calculate the necessary parameters by using equations of motion in a practical situation. VI.2-5

C. Add and multiply two or more vectors by graphical and analytical methods. VI.1-5

D. Quantitatively analyze force-motion relations in a practical situation by using Newton's Laws of Motion . I.5, VI.2

E. Calculate the work done by a force as well as energy calculations and conversion to heat(calories). I.5, VI.1-5

F. Explain different forms of energy and their conversion to each other as well as the Principle of Conservation of Energy in practical situations. I.5

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

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

I. Search for the solution(s) to the assigned projects by examining the available software(s) 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 (enthusiastically) seek the solutions to the given problems which 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. 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. 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, H, J, K
3. Recognize and guess the use of equipment and machines from the units used in their gauges. A-K
4. Calculate wave energy to estimate energy requirement and feasibility in a given situation. F
5. Perform conversions between metric and non-metric units. A
6. Apply the equilibrium equations to rotational motion. B
7. Apply the kinetics equation in torque-motion situations. B
8. Calculate the work done, energy involved, and energy conversions in a given problem involving rotational motion. B
9. Apply a vector approach in solving rotational motion problems. C
10. Apply the general equation of oscillatory motion to a practical situation in order to calculate the necessary parameter. D
11. Apply the one-dimensional wave equation to determine the parameters involved in the motion of a wave such as radio waves. D, E
12. Apply wave energy calculations to determine the wave energy transported to a given point in space. F
13. Solve problems involving mechanical properties of solids, fluids, and gases. G
14. Apply the wave equation and properties of matter to problems involving sound propagation. H
15. Apply the equations involving heat calculation due to temperature change and phase change. I
16. Apply the laws of thermodynamics to selected processes J
17. Solve simple entropy change problems. K

*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 depends 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 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:

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.