PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

MECHANICS & HEAT W/ LAB II
PHYS 1320

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

Laboratory Hours: 3.0 **Revised: Spring 05**

Catalog Course Description:

A calculus-based introduction to mechanics and heat. This course is a continuation of Mechanics and Heat I. It covers rigid body equilibrium, periodic motion, fluid mechanics, heat and thermodynamics, ideal gas behavior, oscillatory motion, and acoustics. 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:

MATH 1910 and PHYS 1310

Co-requisite:

MATH 1920

Textbook (s) and Other Course Materials:

University Physics, by Harris Benson, Revised Edition.
Physics 2010 Lab Manual plus a few handouts.

I. Week/Unit/Topic Basis:

Week	Topic
1	Lecture: Static Equilibrium & Rolling Objects (12.1 Static Equilibrium, 12.2 Rotation and Translation (No-slipping), 12.3 Rotation and Translation (With slipping)) Lab: Group Problems Session
2	Lecture: Vector Description of Rotational Motion (13.1 Torque Vector, 13.2 Angular Velocity & Acceleration Vectors, 13.3 Vector Relations Lab: Group Experiment #1, Newton's 2nd Law for Rotational Motion
3	Lecture: Oscillations (Simple Harmonic Motion, 14.1 Kinematics of SHM, 14.2 The Dynamics of SHM) **Test 1** Lab: Group Experiment #2, Simple Harmonic Motion
4	Lecture: Oscillations (Simple Harmonic Motion, 14.4 Uniform Circular Motion and SHM, 14.5 Damped and Driven Oscillations Lab: Group Problems Session

5	Lecture: One-dimensional Waves (15.1 Introduction, 15.2 Waves Traveling on a String, 15.3 Wave Velocity on a String, 15.4 Energy Transported by Sine-Waves) Lab: Group Experiment #3, Vibrating String
6	Lecture: One-dimensional Waves (15.5 Superposition and Interference, 15.6 The Wave Equation) **Test 2** Lab: Group Problems Session
7	Lecture: Solids, Liquids, and Gases (16.1 States of Matter, 16.2 Stress, Strain, and Elastic Modulus, 16.3 Density and Pressure, 16.4 Fluid Statics) Lab: Group Experiment #4, The Hooke's Law
8	Lecture: Solids, Liquids, and Gases (16.5 Newton's Universal Law of Gravity, 16.6 Fluid Dynamics, 16.7 Dynamic Viscosity) Lab: Group Experiment #5, Archimede's Principle
9	Lecture: Sound (17.1 Models for Sound Waves in a Gas, 17.2 The velocity of Sound, 17.3 Harmonic Waves in Air, 17.4 Sound Intensity and Intensity Level, 17.5 Sources of Sound, 17.6 The Doppler Effect) **Test 3** Lab: Group Experiment #6, Speed of Sound (Air Resonance Tube)
10	Lecture: Thermodynamics and Kinetic Theory (18.1 Temperature, 18.2 Thermal Expansion, 18.3 Heat Energy Transfer Mechanics) Lab: Group Experiment #7, Thermal Expansion Coefficient
11	Thermodynamics and Kinetic Theory (18.4 Heat Capacity and Latent Heat, 18.5 The Equation of State) **Test 4** Lab: Group Experiment #8, Heat Capacity Measurement
12	Lecture: Thermodynamics I: Processes & 1st Law (19.1 Equilibrium, Zero Law & Processes, 19.2 Work, 19.3 The 1st Law of Thermodynamics) Lab: Group Experiment #9, Absolute Temperature: Gas Volume Expansion,
13	Lecture: Thermodynamics I: Processes & 1st Law (19.4 Specific Thermodynamics Processes, 19.5 Cyclic Processes) Lab: Group Problems Session
14	Lecture: Thermodynamics II: The 2nd Law (20.1 The 2nd Law and Heat Engines, 20.2 The Carnot Cycle, 20.3 Refrigerators and Heat Pumps, 20.4 The Abs. Temp. Scale & The 3rd Law) **Test 5** Lab: Group Experiment # 10, Gas Expansion at Constant Volume
15	Lecture: Thermodynamics II: The 2nd Law (20.5 General Cyclic Processes, 20.6 A Formal Def. of State Variables, 20.7 Entropy: A State Variable, 20.8 Entropy Changes for Irreversible Processes, 20.9 Entropy and Disorder Lab: Group Problems Session
16	**COMPREHENSIVE FINAL EXAM (110 minutes)**

II. Course Objectives*:

A. Explain Metric and American units for heat and perform various conversions between the

two, (The gauges at work sites often use both types of units). V.1 & V.3

B. Analyze the equilibrium of rotating, translating, and rolling objects. V.1 & V.4

C. Use a vector approach in the description of rotational motion. V.1 & V.4

D. Realize any periodic and oscillatory motion and be able to determine and calculate the variations of the variables involved. V.1 & V.4

E. Relate the oscillatory motion to wave motion and quantitatively calculate the variables involved in standing and traveling waves. V.1, V.2, V.3,& V.4

F. Calculate wave energy and describe wave interference and superposition. V.2, V.3,& V.4

G. Explain different phases and properties of matter: solid and fluid mechanical and gas dynamics states V.2 & V.4

H. Analyze sound, its velocity in matter, harmonic waves in strings and pipes, resonance, beats, and the Doppler effect. V.1 & V.3

I. Explain temperature, heat, thermal expansion, heat energy transfer mechanisms, heat capacity and latent heat and the equation of state for gases. V.3

J. apply the four laws of thermodynamics to different selected processes and cycles. V.3

K. Explain the importance of entropy and the calculation of entropy losses in selected thermodynamic processes. V.1 & 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, H, J, and K)
3. identify equipment and machines from the units used in their gauges (A-K)
4. calculate wave energy to estimate energy requirement in a given situation (F),
5. perform necessary conversions between metric and non-metric units and systems (A),
6. apply equilibrium equations to rotational motion situations (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 simple rotational motion problems (C),
10. apply the general equation of oscillatory motion to a practical situation in order to calculate and/or measure the necessary parameters (D),
11. apply the one-dimensional wave equation to determine the parameters involved in the motion of a wave such as radio waves (D and 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, & 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 a temperature change as well as a phase change (I),
16. apply the laws of thermodynamics to selected processes (J), and
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 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 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.