PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

ELEMENTS OF PHYSICS II W/LAB
PHY 2220

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

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

Catalog Course Description:

This course is a continuation of Element of Physics I. It covers electricity and magnetism, optics and modern physics. Course includes 3 hours of lecture and 3 hours of laboratory applications.

Entry Level Standards:

Students entering this course must have completed Physics 2210.

Prerequisite:

PHY 2210

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

Physics by Cutnell & Johnson, 4th Edition, Wiley 1997.
Wilson, Jerry D. *Physics Laboratory Experiments*, 5th edition. D.C. Heath and Company, 1994.

I. Week/Unit/Topic Basis:

Week	**Topic**
1	Lecture: Ch.18 Electric Forces and Fields 18.1 The Origin of Electricity 18.2 Charged Objects and Elec. Forces 18.3 Conductors and Insulators 18.4 Charging by Contact & by Induction 18.5 Coulomb's Law 18.6 The Electric Field 18.7 Electric Field Lines 18.8 The Elec. Field Inside a Conductor 18.9 Gauss' Law 18.10 Copiers and Computer Printers Lab: Group Problems Session
2	Lecture: Ch.19 Electric Potential Energy 19.1 Potential Energy 19.2 The Electric Potential Difference 19.3 Elec. Pot. Diff. by Point Charges 19.4 Equipotential Surfaces 19.5 Capacitors and Dielectrics Lab: Group Exeriment One: Fields and Equipotentials

3 Lecture: Ch.20 Electric Circuits
20.1 Electromotive Force and Current
20.2 Ohm's Law
20.3 Resistance and Resistivity
20.4 Electric Power
Lab: Group Experiment #2: Ohm's Law

4 Lecture: Ch.20 Electric Circuits
20.5 Alternating Current
20.6 Series Wiring
20.7 Parallel Wiring
20.8 Mixed Series and Parallel Wiring
20.9 Internal Resistance
Lab: Group Experiment 3: Resistances in Series and Parallel

5 Lecture: Ch.20 Electric Circuits
20.10 Kirchhoff's Rules
20.11 The Measurm. of Current & Voltage
20.12 Capacitors in Series and Parallel, Kirchhoff's Rules
20.13 RC Circuits
20.14 Physiological Effects of Current
Lab: Group Experiment 4: Multi-Loop Circuits

6 Lecture: Ch.21 Magnetic Forces and Fields
21.1 Magnetic Field
21.2 Force of a Magnetic. Field on a Moving Charge
21.3 Motion of a Charge in a Mag. Field
21.4 The Mass Spectrometer
21.7 Magn. Fields Produced by Currents
Lab: Group Experiment 5: RC-Circuit (Time Constant)

7 Lecture: Ch.22 Electromagnetic Induction
22.1 Induced Emf and Induced Current
22.2 Motional Emf
22.3 Magnetic Flux
22.4 Faraday's Law
22.5 Lenz's Law
22.6 Applic. of Electrom. Induction in Sound Production
22.7 The Electric Generator
22.8 Mutual Inductance and Self Inductance
22.9 Transformers
Lab: Group Experiment 6: Electromagnetic Induction

8 Lecture: Ch.23 Alternating Current Circuits
23.1 Capacitors & Capacitive Reactance
23.2 Inductors and Inductive Reactance
23.3 RCL Circuits
23.4 Resonance in Electric Circuits
23.5 Semiconductor Devices
Lab: Group Experiment 7: The Joule Heat

9 Lecture: Ch.24 Electromagnetic Waves
24.1 The Nature of Electroma. Waves
24.2 The Electromagnetic Spectrum
24.3 The Speed of Light

24.4 The Energy Carried by EM Waves
24.5 The Doppler Effect and EM Waves
24.6 Polarization
Lab: Group Experiment 8: The Mass of Electron

10 Lecture: Ch.25 The Reflection of Light
25.1 Wave Fronts and Rays
25.2 The Reflection of Light
25.3 Image in a Plane Mirror
25.4 Spherical Mirrors
25.5 Images in Spherical Mirrors
25.6 Mirror Equation and Magnification
Lab: Group Experiment 9: Reflection and Refraction

11 Lecture: Ch.26 The Refraction of Light: Lenses
26.1 The Index of Refraction Ch. 31,
26.2 Snell's Law of Refraction
26.3 Total Internal Reflection
26.4 Polarization and the Reflection and Refraction of Light
26.5 The Dispersion of Light
Lab: Ch. 31, Nuclear Physics and Redioactivity

12 Lecture: Ch.26 The Refraction of Light
26.6 Lenses
26.7 The Formation of Images by Lenses
26.8 The Thin-Lens Equation
26.9 Lenses in Combination
26.10 The Human Eye
26.11 Angular Magnification and The Magnifying Glass
26.12 The Compound Microscope
26.13 The Telescope
26.14 Lens Aberration
Lab: Ch. 31, Nuclear Physics and Radioactivity

13 Lecture: Ch.27 The Wave Nature of Light
27.1 Principle of Linear Superposition
27.2 Young's Double-Slit Experiment Interference of Light
27.3 Thin Film Interference
27.5 Diffraction
27.7 Diffraction Grating
27.8 Compact Discs & Use of Interference
27.9 X-Ray Diffraction
Lab: Group Experiment 10: Diffraction Grating

14 Lecture: Ch.28 Particles and Waves
29.1 The Wave-Particle Duality
29.2 Blackbody Rad. & Planck's Constant
29.3 Photons and Photoelectric Effect
29.5 The DeBroglie Wavelength and The Wave Nature of Matter
29.6 The Heisenberg Uncertainty Principle
Lab: Group Experiment 11: Line Spectra and Rydberg Constant

15 Lecture: Ch.30 The Nature of Atom
30.1 Rutherford Scattering and The Nuclear Atom
30.2 Line Spectra

30.3 The Bohr Model of Hydrogen Atom
30.5 The Quantum Mechanical Picture of the Hydrogen Atom
30.6 The Pauli Exclusion Principle and The Periodic Table of Elements
30.7 X-Rays
30.8 The Laser
Lab: Group Problem 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. Calculate and analyze the forces involved and the electric field orientation of point charges and simple line charges. VI.1-5

C. Explain the potential and potential difference and apply the concepts to practical situations and problems solution. I.5

D. Calculate capacitor related problems and realize the use of capacitors in electronics and industry. I.5, V1.1-5

E. Apply the Ohm's Law to simple circuit problems and calculate the relevant currents, voltages and powers. I.5

F. Apply the emf and internal resistance concepts to circuits containing batteries. I.5

G. Apply Kirchhoff's rules to general circuits. I.5

H. Explain magnetism, its cause, and the force of a magnetic field on a moving charge and its applications in industry. I.5

I. Realize the effect of alternating current on inductors and capacitors. I.5

J. Explain the concepts of electromagnetic waves, spectrum, Doppler effect, and polarization and their relevant applications. I.5

K. Use the reflection and refraction laws to solve plane mirror, spherical mirror, and lens problems and their application in optical devices. I.5

L. Realize the wave-like behavior of light through interference and diffraction phenomena and calculate and measure the wavelength of an unknown wave by the methods learned. I.5

M. Learn about the particle-like behavior of light, the wave particle duality, the photoelectric effect, the wave nature of matter, and relate to the quantum mechanics concept. I.5

N. Know about the nature of atom, line spectra, the Bohr model of hydrogen, X-rays, and Laser as an introduction to modern physics. I.5

O. Search for the solution 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-O

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

3. Recognize and guess the use of equipment and machines from the units used in their gauges. A, C, D, E, H, I

4. Realize the application of electric fields in industry. B

5. Master energy calculations to estimate energy requirement and feasibility in a given situation. D, E, F, G, H, I

6. Perform necessary conversions between metric and non-metric units and systems. A

7. Calculate and analyze the resultant force of a group of point charges on a single charge. B

8. Calculate the potential and potential energy associated with point charges and parallel-plate capacitors. C

9. Calculate the charge, voltage, capacity, and energy stored in capacitors. D

10. Apply the Ohm's Law to simple parallel and series circuit problems to calculate the current through, voltage across, and energy consumption associated with each element. E, F

11. Recognize the series and parallel connection of circuit elements and apply the relevant formulas. E

12. Apply the Kirchhoff's rules to circuits to solve for the unknowns. E, F, G

13. Solve problems on the charging and discharging of capacitors and explain the effect of the time-constant of the capacitors in the process with respect to relevant applications. G

14. Solve simple RC-circuit problems and know their applications. G

15. Explain magnetism and its cause, and calculate the force exerted by a uniform magnetic field and a moving charge. H

16. Explain magnetic induction and apply the Faraday's law to calculate the emf produces by an induced magnetic flux. H

17. Calculate the capacitive and inductive reactances for capacitors and inductors are exposed to alternating currents. I

18. Solve simple RCL series circuit problems. I

19. Explain how electromagnetic waves are generated and travel through media and vacuum. J

20. Explain electromagnetic spectrum and the relation between, wave speed, frequency, and wavelength. J

21. Explain the Doppler effect and its use to calculate blue and red shifts. J

22. Explain the straight-line motion, wave-like, and particle-like behavior of light. K

23. Solve plane and spherical mirror problem as well as lens problems. K

24. Explain the wave-like behavior of light via interference and diffraction phenomena and calculate the variables in the Young's formula. L

25. Explain the particle-like behavior of light and calculate the quanta of energy associated with the photoelectric effect. M

26. Know the Bohr atom calculation of the atomic radius and be able to calculate the energy associated with different layers of the hydrogen atom. N

27. Explain the Pauli exclusion and Heisenberg uncertainty principles. 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 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.