Class Hours: 3.0 Credit Hours: 4.0
Laboratory Hours: 3.0 Revised: Spring 2016

Catalog Course Description:
This course is a continuation of Non-Calculus-Based Physics I. It covers electricity and magnetism, optics and modern physics. Course includes three hours of lecture and three hours of laboratory applications.

Prerequisite
PHYS 2010

Textbook (s) and Other Course Materials:
Texts: Physics by Cutnell & Johnson, 9th Edition (Wiley) may be used as reference. The course material is available at PSCC Website.
Lab Manual: Physics 2020 Lab Manual (available at PSCC Website)

I. Week/Unit/Topic Basis:

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<th>Week</th>
<th>Topic</th>
<th>Laboratory</th>
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<td><strong>Chapter 18: Electric Forces and Fields</strong></td>
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<td>The Origin of Electricity</td>
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<td>Charged Objects and Electric Forces</td>
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<td>Conductors and Insulators</td>
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<td>Charging by Contact &amp; by Induction</td>
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<td>Coulomb's Law</td>
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<td>Electric Field and Field Lines, Gauss' Law</td>
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<td><strong>Chapter 19: Electric Potential Energy</strong></td>
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<td>Potential Energy</td>
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<td>The Electric Potential Difference</td>
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<td>Elec. Pot. Diff. by Point Charges</td>
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<td>Equipotential Surfaces</td>
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<td>Capacitors, Dielectrics, and Capacitors</td>
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<td>Connections</td>
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<td><strong>Experiment # 0:</strong> The Application of Multi-meters</td>
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<td><strong>Chapter 20: Electric Circuits</strong></td>
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<td>Electromotive Force and Current</td>
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<td>Ohm's Law, Resistance and Resistivity</td>
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<td>Electric Power, Alternating Current</td>
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<td>Series, Parallel, and Mixed Connection of</td>
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<td>Resistors</td>
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<td><strong>Experiment #1:</strong> Electric Field Mapping</td>
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<td><em>To be Performed Online</em></td>
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Chapter 20: Continued...
Internal Resistance, Kirchhoff's Rules
RC Circuits

Chapter 21: Magnetic Forces and Fields
Magnetic Field
The Force of a Magnetic Field on a Moving Charge
Motion of a Charged Particle in a Magnetic Field
The Velocity Selector, The Cyclotron
A Simple Relativistic Calculation
Magnetic Fields Produced by Currents

Chapter 22: Electromagnetic Induction
Magnetic Flux, Induced emf., and Faraday's Law
Lenz's Law, The Electric Generator
Inductors, Self-Inductance, Transformers

Chapter 23: Alternating Current Circuits
Capacitors & Capacitive Reactance
Inductors and Inductive Reactance
RCL Circuits, Resonance in Electric Circuits
The Electric Oscillator

Chapter 24: Electromagnetic Waves
The Nature of Electromagnetic Waves
The Electromagnetic Spectrum
The Speed of Light

Chapter 25: Geometric Optics
The Reflection of Light, Mirrors:
The Reflection of Light
Image in Plane Mirrors
Image in Spherical Mirrors
Mirror Equation and Magnification

Chapter 26: Geometric Optics
The Refraction of Light
The Index of Refraction, Snell's Law of Refraction
Total Internal Reflection
Lenses:
The Formation of Images by Lenses
The Thin-Lens Equation
Lenses in Combination, The Convergence Theorem
The Refractor Telescope
The Human Eye
Lens Aberration, The Dispersion of Light

Chapter 27: Wave Optics

Experiment #2: Ohm's Law
Experiment #3: Resistors in Series and Parallel
Experiment #4: The Joule Heat
Experiment #5: Multi-Loop Circuits (Kirchhoff's Rules)
Experiment #6: RC-Circuit with a DC Source
Experiment #7: The Mass of Electron
Experiment #8: Reflection of Light
8.1: Flat Mirrors
8.2: Spherical Mirrors
Experiment #9:
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Chapter 29: Quantum Optics
The Wave-Particle Duality
Planck’s Formula & Planck's Constant
Photons and Photoelectric Effect
The de Broglie Wavelength
The Heisenberg Uncertainty Principle

9.1: Snell's Law
9.2: Image in Converging Lenses

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Chapter 30: The Nature of Atom
The Bohr Model of Hydrogen Atom
The Quantum Mechanical Picture
The Pauli Exclusion Principle
X-Rays and Laser

Experiment #10: Interference of Light (Diffraction Grating)

Experiment #11: Line Spectra and Rydberg’s Constant

14
Chapter 31: Nuclear Physics and Radioactivity
Nuclear Structure and Strong Nuclear Forces
Radioactivity, and Radioactive Decay
Radioactive Dating
Reactors and Nuclear Energy
A Simple Nuclear Energy Calculation

15
Final Exam (Comprehensive)

II. Course Goals*:

The course will:

A. Expand students’ knowledge of physics principles in order to enhance their ability in applying scientific method as they pursue their goals and dreams in life. (V2, V3, V4, and V5)

B. Guide students in taking a logical approach in obtaining experimental data in order to make an objective analysis of the results. (V1, V2, and V3)

C. Enhance students’ critical thinking ability and problem-solving skills. (V1 and V2)

D. Enhance students’ verbal and writing skills as a result of evidence-based analysis. (V3)

E. Enhance effective use of mathematics. (V2)

F. Develop an understanding of the importance of life-long learning and personal development. (V4 and V5)

* Roman numerals after course goals reference TBRs general education goals.

III. Expected Student Learning Outcomes*:

The student will be able to:
1. Apply learned physics concepts to theoretical and practical situations. (A, through F)

2. Apply learned physics concepts to estimate an unknown parameter in a given practical situation by using the physics principle(s) involved. (A, through F)

3. Recognize and identify the use of equipment and machines from the units used on their gauges. (A and F)

4. Have an understanding of energy calculation to estimate energy cost in a given situation. (A, C, D, E, and F)

5. Perform necessary conversions between Metric and non-metric units and systems. (A and E)

6. Calculate and analyze the resultant force of a group of point charges on a single charge. (A, C, and E)

7. Calculate the potential and potential energy of point charges and parallel-plates capacitors. (A, C, and E)

8. Calculate the charge, voltage, capacity, and energy stored in capacitors (E).

9. Apply Ohm's Law to simple parallel and series circuit problems to calculate the current through, voltage across, and energy consumption associated with each element. (A, C, and E)

10. Apply Kirchhoff's rules to multi-loop circuits to solve for unknowns. (A, C, and E)

11. Solve RC circuit problems and explain the effect of the time-constant of such circuits on the speed of the charging processes. (A, C, and E)

12. Explain magnetism and its cause, and calculate the force exerted by a uniform magnetic field on a moving charge. (A, C, and E)

13. Solve magnetic induction problems and apply Faraday's law to calculate the emf produced by an induced magnetic flux. (A, C, and E)


15. Solve simple RCL series circuit problems. (A, C, and E)

16. Explain electromagnetic spectrum and the relation between wave speed, frequency, and wavelength. (A, C, and E)

17. Explain the straight-line motion, wave-like, and particle-like behavior of light (A, C, and E)

18. Solve mirror problem as well as lens problems including simple applications. (A, C, and E)

19. Explain the wave-like behavior of light via interference and diffraction phenomena and calculate the variables in the Young's double-slit formula. (A, C, and E)

20. Have an understanding of the particle-like behavior of light and calculate the quanta of energy associated with the photoelectric effect. (A, C, and E)

21. Have an understanding of the de Broglie wavelength that relates the wavelike behavior of light to its particle-like behavior. (A, C, and E)
22. Have an understanding of radioactivity and its cause. (A and C)
23. Have an understanding of how radioactivity is used in radioactive dating. (A, C, and E)
25. Calculate nuclear energy using Einstein’s mass-energy conversion formula and have an understanding of its equivalent mechanical or electrical energy. (A, C, and E)

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

IV. Evaluation:

**Course Grade** = 0.75 (Theory grade) + 0.25 (Lab Grade)

A. Testing Procedures: 75% of the course grade

**For Campus-based Students:**

**Theory Grade** = 0.80 (Mean of Chapter Tests and Quizzes) + 0.20 (Comprehensive Final)

There will be 4 to 6 tests each of which includes solving problems as well as answering multiple-choice questions. There will one quiz on Chapter 30 and one on Chapter 31.

**For Online Students:**

**Theory Grade** = 0.70 (Mean of Chapter Tests) + 0.30 (Comprehensive Final)

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

B. Laboratory Expectations: 25% of the course grade

**Laboratory Grade** = (the sum of reports grades) / (the number of the reports).

11 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.**

C. Field Work:

An instructor who finds an opportunity for site visits or field work may give a maximum of 10% to this evaluation measure by adjusting the percentage in Part A.

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 Academic Affairs, 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 Academic Affairs.

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.

Please see the Pellissippi State Policies and Procedures Manual, Policy 04:02:00 Academic/Classroom Conduct and Disciplinary Sanctions for the complete policy.

C. Accommodations for disabilities:

Students that 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 Disability Services (DS) in order to receive accommodations in this course. Disability Services may be contacted by sending email to disabilityservices@pstcc.edu, or by visiting Alexander 130. More information is available at http://www.pstcc.edu/sswd/.