PELLISSIPPI STATE COMMUNITY COLLEGE
MASTER SYLLABUS

NON-CALCULUS-BASED PHYSICS II
PHYS 2020

Class Hours: 3 **Credit Hours:** 4
Laboratory Hours: 3 **Revised:** Fall 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.

Prerequisites: PHYS 2010

Corequisites: None

Textbook(s) and Other Course Materials:

Physics by Cutnell & Johnson, 9th Edition (Wiley) may be used as the course reference. The course material as well as its related laboratory manual are available at PSCC Website.

Week/Unit/Topic Basis:

Week	Topics	Laboratory
1	**Chapter 18: Electric Forces and Fields:** The Origin of Electricity, Charged Objects and Electric Forces, Conductors and Insulators, Charging by Contact & by Induction, Coulomb's Law, and Electric Field and Field Lines, Gauss' Law	**Experiment 0:** The Application of Multi-meters
2	**Chapter 19: Electric Potential Energy:** Potential Energy, The Electric Potential Difference, Elec. Pot. Diff. by Point Charges, Equipotential Surfaces, and Capacitors, Dielectrics, and Capacitors Connections	**Experiment 1:** Electric Field Mapping**:** ***To be Performed Online***
3	**Chapter 20: Electric Circuits:** Electromotive Force and Current, Ohm's Law, Resistance and Resistivity Electric Power, Alternating Current, and Series, Parallel, and Mixed Connection of Resistors	**Experiment 2:** Ohm's Law
4	**Chapter 20 Continued…:** Internal Resistance, Kirchhoff's Rules, and RC Circuits	**Experiment 3:** Resistors in Series and Parallel
5	**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, and Magnetic Fields Produced by Currents	**Experiment 4:** The Joule Heat

Week	Topics	Laboratory
6	**Chapter 22: Electromagnetic Induction:** Magnetic Flux, Induced emf,, and Faraday's Law, Lenz's Law, The Electric Generator, Inductors, Self-Inductance, and Transformers	**Experiment 5:** Multi-Loop Circuits (Kirchhoff's Rules)
7	**Chapter 23: Alternating Current Circuits:** Capacitors & Capacitive Reactance, Inductors and Inductive Reactance, RCL Circuits, Resonance in Electric Circuits, and The Electric Oscillator	**Experiment 6:** RC-Circuit with a DC Source
8	**Chapter 24: Electromagnetic Waves:** The Nature of Electromagnetic Waves, The Electromagnetic Spectrum, and The Speed of Light	**Experiment 7:** The Mass of Electron
9	**Chapter 25: Geometric Optics: The Reflection of Light, Mirrors:** Image in Plane Mirrors, Image in Spherical Mirrors, Mirror Equation, and Magnification	**Experiment 8:** Reflection of Light**:** **8.1:** Flat Mirrors **8.2:** Spherical Mirrors
10	**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, and The Dispersion of Light	**Experiment 9:** Refraction of Light **9.1:** Snell's Law **9.2:** Image in Converging Lenses
11	**Chapter 27: Wave Optics: The Wave Nature of Light:** Principle of Linear Superposition, Young's Double-Slit Experiment, Diffraction, Thin Film Interference, Diffraction Grating, and X-Ray Diffraction	**Problems Session**
12	**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	**Experiment 10:** Interference of Light (Diffraction rating)
13	**Chapter 30:The Nature of Atom:** The Bohr Model of Hydrogen Atom, The Quantum Mechanical Picture, The Pauli Exclusion Principle, X-Rays, and Laser	**Problems Session**
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	**Experiment 11:** Line Spectra and, Rydberg’s Constant
15	**Final Exam (Comprehensive)**	

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 objectives reference the TBR general education goals**.**

Expected Student Learning Outcomes*:
Students will

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 based on the units 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 process. (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)
14. Solve problems involving capacitive reactance and inductive reactance in AC circuits. (A, C, and E)
15. Solve geometric optics problems by making measurements in mirrors, lenses, and transparent media. (A, C, and E)
16. Have an understanding of apparent depth, total reflection, image in mirrors and lenses, refractor telescopes, the optics of human eye lens, and the dispersion phenomenon. (A, C, and E)
17. Have an understanding of the wave nature of light by experimenting the interference phenomenon and apply the interference concept in measuring the wavelength of an unknown source. (A, C, and E)

18. Have an understanding of diffraction, diffraction patterns, and the use of diffraction gratings in wavelength measurements. (A, C, and E)

19. Have an understanding of the particle-like behavior of light, basic quantum mechanics, and wave-particle duality. (A, C, and E)

20. Have an understanding of the nature of atoms and how empty they are compared to condensed matter, the way Bohr model is used to measure the radius of hydrogen atom, particles and waves, light generation, the photoelectric effect, Compton Effect, how particles have wavelike behavior, and vice versa. (A through F)
21. Have an understanding of radioactivity and its cause, isotopes, radiation types, radioactive decay, C-14 dating, nuclear energy, reactors, and the mathematics of radioactive decay. (A through F)

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

Evaluation:

A. Tests**:** 75% of grade
   This 75% is the mean theory grade calculated as
   For Campus-based Students:
   Theory Grade = 0.80 (Tests + Quizzes) + **0.20** (Comprehensive Final)
   There will 4 to 6 tests each of which include problems as well as multiple-choice questions. There will be 2 quizzes**:** one on Chapter 30 and one on Chapter 31.

   For Online Students:

   Theory Grade = 0.70 (Tests) + **0.30** (Final)

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

B. Laboratory Experiments**:** 25% of 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: _____% of grade
   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. Grading Scale: 91 to 100: A, 87 to 91: B+, 81 to 87: B, 77 to 81: C+, 70 to 77: C, & 60 to 70: D.

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 (http://www.pstcc.edu/sswd/) may be contacted via email or by visiting Alexander 130.