PELLISSIPPI STATE COMMUNITY COLLEGE

MASTER SYLLABUS

CALCULUS-BASED PHYSICS I
PHYS 2110

Class Hours: 3 **Credit Hours:** 4

Laboratory Hours: 3 **Revised:** Fall 2016

Catalog Course Description:

For students majoring in engineering, mathematics, and physics. This is a calculus-based approach to topics in electricity and magnetism**.** Course includes three hours of lecture and three hours of laboratory applications**.**

Prerequisites:

MATH 1920

Corequisites:

ENS 1510; however, it is preferred to complete at least ENS 1510 before taking this course.

Textbook(s) and Other Course Materials:

University Physics, Revised Edition, by Harris Benson (Wiley) may be used as reference**.** The course material is available at PSCC Website**.**

Week/Unit/Topic Basis:

Week	Topics	Laboratory
1	**Chapters 22 & 23:** (Level I**,** Algebra-based) Electric Charge, Electric Force, and Electric Field	Multi-meters**:** Voltage, Resistance, and Current
2	**Chs. 25 & 26:** (Level I**,** Algebra-based) Electric Potential, Potential Energy, Capacitors, & Dielectrics	**Experiment 1:** Electric Field Mapping
3	**Chapters 27 & 28:** Current, Resistance, Circuits	**Experiment 2:** Ohm's Law
4	**Chapters 27 & 28:** Resistivity and Heat, RC Circuits	**Experiment 3:** Series & Parallel Resistors
5	**Chapters 29 & 30:** (Level I**:** Algebra-based Portion) Magnetic Field and Magnetic Field Sources	**Experiment 4:** The Joules Heat

Week	Topics	Laboratory
6	**Chapters 31 & 32:** Electromagnetic Induction	**Experiment 5:** Kirchhoff's Rules
7	**Chapters 31 and 32:** Inductance, continued…	**Experiment 6:** RC Circuits
8	**Ch. 33:** Alternative Current Sources & AC Circuits	**Experiment 7:** The Mass of Electron
9	**Ch. 33:** AC Circuits, continued…	Problems Session
10	**Ch. 24:** Gauss's Law (Level II)	**Experiment 8:** Electromagnetic Induction
11	**Chs. 23&25:** (Level II**:** Calc.-based Portion)	Problems Session
12	**Chs. 29&30:** (Level II**:** Calculus-based Portion)	Problems Session
13	**Ch. 31:** (Level II**:** Calculus-based Portion)	**Experiment 9:** Oscilloscope
14	**Chapter 34:** Maxwell's Equations	**Experiment 10:** RC Circuit with an AC Source
15	**Final Exam**	

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. Have an understanding of energy calculation to estimate energy cost in a given situation. (A, C, D, E, and F)
4. Calculate and analyze the resultant force of a group of point charges on a single charge. (A, C, and E)
5. Calculate the potential and potential energy of point charges and parallel-plates capacitors. (A, C, and E)
6. Calculate the charge, voltage, capacity, and energy stored in capacitors (E).
7. 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)
8. Apply Kirchhoff's rules to multi-loop circuits to solve for unknowns. (A, C, and E)
9. 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)
10. Explain magnetism and its cause, and calculate the force exerted by a uniform magnetic field on a moving charge. (A, C, and E)
11. Apply Gauss' Law to derive the electric field formulae for symmetric charge distributions.
12. Solve magnetic induction problems and apply Faraday's law to calculate the emf produced by an induced magnetic flux. (A, C, and E)
13. Solve problems involving capacitive reactance & inductive reactance in AC circuits. (A, C, & E)
14. Solve simple RCL series circuit problems. (A, C, and E)
15. Explain electromagnetic spectrum and the relation between wave speed, frequency, and wavelength. (A, C, and E)
16. Write down Maxwell's equations and interpret the concept of each. (A, C, and E)
17. Have an understanding of the electromagnetic energy transport in space and the Poynting vector. (C and E)
18. Apply sophomore level mathematics in the derivation of the electricity and magnetism formulae. (C and E)

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

Evaluation:

A. Tests (Theory Portion)**:** 75% of the course grade

This 75% is calculated as

Theory Grade = 0.80 (Tests + Quizzes) + **0.20** (Final)

There will 4 to 6 tests each of which include problems as well as multiple-choice questions.

B. Laboratory Experiments**:** 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: _____% 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.