

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

**ELECTRICITY & MAGNETISM W/LAB
PHY 2310**

Class Hours: 3.0

Credit Hours: 4.0

Laboratory Hours: 3.0

**Date Revised: Spring
01**

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 3 hours of lecture and 3 hours of laboratory applications.

Entry Level Standards:

It is preferred to take this course after completing differential equations.

Prerequisites:

ENS 1210, 1310; MTH 1420

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

University Physics, Revised Edition by Harris Benson, Wiley
Wilson, Jerry D. *Physics Laboratory Experiments*. D.C. Heath and Company, Fifth Edition.

I. Week/Unit/Topic Basis:

Week	Topic
1	Lecture: 22.1 thru 22.5, Electrostatics Lab: 22.1 thru 22.5, Electrostatics
2	Lecture: 23.1 thru 23.8, The Electric Field Lab: Group Exp. #1
3	Lecture: 24.1 thru 24.4, Gauss's Law Lab: Group Problems Session
4	Lecture: 25.1 thru 25.6, Electric Potential Lab: Group Problems Session
5	Lecture: 26.1 thru 26.7, Capacitors & Dielectrics Lab: Group Problems Session
6	Lecture: 27.1 thru 27.6, Current and Resistance Lab: Group Exp. #2
7	Lecture: 28.1 thru 28.5, Direct Current Circuits Lab: Group Exp. #3

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| 8 | Lecture: 29.1 thru 29.8, The Magnetic Field
Lab: Group Exp. #4 |
| 9 | Lecture: 30.1 thru 30.4, Magnetic Field Sources
Lab: Group Exp. #5 |
| 10 | Lecture: 31.1 thru 31.8 Electromagnetic Induction
Lab: Group Exp. #6 |
| 11 | Lecture: 32.1 thru 32.6 Inductance
Lab: Group Exp. #7 |
| 12 | Lecture: 33.1 thru 33.4 AC Circuits
Lab: Group Exp. #8 |
| 13 | Lecture: 33.5 thru 33.9 AC Circuits
Lab: Group Exp. #9 |
| 14 | Lecture: 34.1 thru 34.8 Maxwell's Equations
Lab: Group Exp. #10 |
| 15 | Lecture: Review
Lab: Group Problems Session |
| 16 | Final Exam Period |

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. Qualitatively describe the nature of forces between electric charges. I.5
- C. Quantitatively analyze the Coulomb's Law. I.5
- D. Calculate and map the electric field for simple charge distributions. IV.1-5
- E. Apply the Gauss's Law to different simple charge distributions in order to determine the electric field. I.5
- F. Explain the electric potential and the concept of electric potential energy. I.5
- G. Use the concepts of field and potential to analyze the capacitors and their electric energy storage capacity and the role of dielectrics. I.5
- H. Analyze and calculate the current through, voltage across, and the energy dissipation in resistors as typical elements of a circuit. I.5, VI.1-5
- I. Analyze and calculate the current and voltage in multi-loop circuits. VI.1-5
- J. Calculate the magnetic field and its effect on moving charges. VI.1-5
- K. Describe the effect of electric and magnetic fields used in cyclotrons and other particle accelerators. I.5
- L. Describe the Faraday's Law of electromagnetic induction and the induced electromotive force. I.5

- M. Analyze simple AC circuits such as LC-, LR-, RC, RLC- Series circuits. I.5
- N. Qualitatively explain the Maxwell's equations. 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-N
2. Estimate an unknown parameter in a given practical situation by using the physics principles involved. C, G, H, I, J, K, L, M
3. Master simple energy calculations to estimate energy requirement and feasibility in a given situation. F, G, H, K
4. Perform necessary conversions between metric and non-metric units and systems. A

5. Apply the Kirchhoff's rules to analyze circuits. H, I, M
6. Apply the kinetics equation in force-motion situations. B, C
7. Calculate the work done, energy involved, and energy conversions in a given problem. F, G, J
8. Solve problems involving the motion of charged particles in a magnetic field. J, K, L, M
9. Analyze the motion of charged particles in a magnetic field and its application in cyclotrons. J, K
10. Apply a vector approach where vectors are involved. B, C, D, E, F, J, K, L, M, N
11. Resolve a vector into two components graphically and analytically. B-G, J-N
12. Calculate the effect of a changing magnetic flux through a surface, and the generated emf. L
13. Calculate the effect of alternating currents on inductors, capacitors LC, LR, RC, and LRC circuits. M
14. Write down and interpret the Maxwell's equations. 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:

$$\text{Course Grade} = (0.75) \times (\text{Theory Grade}) + (0.25) \times (\text{Lab Grade})$$

$$\text{Theory Grade} = 0.80 (\text{Tests} + \text{Quizzes} + \text{H.W.}) + 0.20 (\text{Comprehensive Final})$$

(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.

$$\text{Lab Grade} = (\text{the sum of report grades}) / (\text{the number of the reports})$$

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.