BUTTE COLLEGE
COURSE OUTLINE

I. **CATALOG DESCRIPTION**

PHYS 42 - Physics for Scientists and Engineers II **4 Unit(s)**

Prerequisite(s): PHYS 41, MATH 31
Recommended Prep: NONE

Transfer Status: CSU/UC
51 hours Lecture
51 hours Lab

This course, intended for students majoring in physical sciences and engineering, is part of a three-semester course whose contents may be offered in other sequences or combinations. Core topics include electrostatics, magnetism, DC and AC circuits, and Maxwell's equations. It is highly recommended that students also enroll in PHYS 52. (C-ID PHYS 210). Graded only.

II. **OBJECTIVES**

Upon successful completion of this course, the student will be able to:

A. Analyze simple static charge distributions and calculate the resulting electric field and electric potential.
B. Analyze simple current distributions and calculate the resulting magnetic field.
C. Predict the trajectory of charged particles in uniform electric and magnetic fields.
D. Analyze DC and AC circuits in terms of current, potential difference, and power dissipation for each element.
E. Analyze basic physical situations involving reflection and refraction, and use this analysis to predict the path of a light ray.

III. **COURSE CONTENT**

A. **Unit Titles/Suggested Time Schedule**

Lecture

Topics		Hours
1.	Electrostatics	5.00
2.	Fields	4.00
3.	Potentials	4.00
4.	Gauss's Law	3.00
5.	DC circuits	3.00
6.	Capacitors	3.00
7.	Resistivity	2.00
8.	Magnetism	9.00
9.	AC Circuits	5.00
10.	Faraday's and Lenz's Laws	3.00
11.	Ampere's Law	2.00
12.	Maxwell's Equations	2.00
13.	Properties of EM Waves	2.00
14.	Physical Optics	2.00
15.	Geometric Optics	2.00
Total Hours		51.00

Lab

Topics		Hours
1.	Electrostatics	6.00
2.	Fields	3.00
3.	Potentials	3.00
4.	Gauss's Law	6.00
5.	DC circuits	3.00
6.	Capacitors	3.00
7.	Resistivity	3.00
8.	Magnetism	3.00
9.	AC Circuits	3.00
10.	Faraday's and Lenz's Laws	3.00
11.	Ampere's Law	3.00
12.	Maxwell's Equations	3.00
13.	Properties of EM Waves	3.00
14.	Geometric Optics	3.00
15.	Physical Optics	3.00
Total Hours		51.00

IV. METHODS OF INSTRUCTION

A. Lecture
B. Instructor Demonstrations
C. Homework: Students are required to complete two hours of outside-of-class homework for each hour of lecture
D. Discussion
E. Problem-Solving Sessions
F. Laboratory Experiments
G. Individual Tutoring

V. METHODS OF EVALUATION

A. The evaluation of student progress will be accomplished through the use of written examinations, tests, quizzes, homework assignments, and a final examination.
B. The evaluation of student laboratory progress will be through laboratory reports.

VI. EXAMPLES OF ASSIGNMENTS

A. Reading Assignments
   1. Read through the example coulombs law problem. Be prepared to solve a similar problem in class.
   2. Read Feynman's discussion of cargo cult science. Prepare to contrast the development of Maxwell's equations with other self described sciences.
B. Writing Assignments
   1. Write an annotated and complete solution of the electric field around a uniformly charged thin rod. Include an analysis of the limiting behavior of the solution both near and far from the rod.
   2. Write a thorough report on the determination of the magnetic field of the Earth. Include an introduction, a paragraph on historical measurements of the Earths magnetic field,

annotated derivations of the underlying relationships used in the experiment and error analysis.

C. Out-of-Class Assignments

1. Calculate the energy usage per month from the lights in your house using the power ratings on the lights and estimates for the usage. Compare this with the total energy usage from your PG&E bill. (If you do not have access to such things use the house of a friend or parents.)
2. Look up the conductivity of silver, gold, copper and steel. Contrast this with glass, paper, plastic and wood. Be prepared to discuss the rough categorization of materials as conductors or insulators.

VII. RECOMMENDED MATERIALS OF INSTRUCTION

Textbooks:

A. Halliday, D., Resnick, R., & Walker, J.. Fundamentals of Physics Extended. 9th Edition. Wiley, 2011.

Materials Other Than Textbooks:

A. Eggert, S., Trento, J., and White, R.. Physics 42 Lab manual, purchase at the bookstore.
B. Miscellaneous graph paper will be required for experimental write-ups.
C. A scientific calculator is recommended.

Created/Revised by: Robert White
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