PHYS 4C Course Outline as of Fall 1983

CATALOG INFORMATION

Dept and Nbr: PHYS 4C Title: PHYS FOR SCI & ENGN
Full Title: Physics for Scientists & Engineers
Last Reviewed: 9/26/2022

Units		Course Hours per Week		Nbr of Weeks	Course Hours Total	
Maximum	4.00	Lecture Scheduled	3.00	17.5	Lecture Scheduled	52.50
Minimum	4.00	Lab Scheduled	3.00	17.5	Lab Scheduled	52.50
		Contact DHR	0		Contact DHR	0
		Contact Total	6.00		Contact Total	105.00
		Non-contact DHR	0		Non-contact DHR	0

Total Out of Class Hours: 105.00 Total Student Learning Hours: 210.00

Title 5 Category: AA Degree Applicable
Grading: Grade Only
Repeatability: 00 - Two Repeats if Grade was D, F, NC, or NP
Also Listed As:
Formerly:

Catalog Description:
Electricity and magnetism.

Prerequisites/Corequisites:
Phys 4A with a grade of "C" or better, Math 2A completed or in progress.

Recommended Preparation:

Limits on Enrollment:

Schedule of Classes Information:
Description: Electricity & magnetism. (Grade Only)
Prerequisites/Corequisites: Phys 4A with a grade of "C" or better, Math 2A completed or in progress.
Recommended:
Limits on Enrollment:
Transfer Credit: CSU;UC. (CAN PHYS12)(PHYS 4A+PHYS 4C+PHYS 4B=PHYS SEQ B)(PHYS 4D+PHYS 4A+PHYS 4C+PHYS 4B=PHYS SEQ C)
Repeatability: Two Repeats if Grade was D, F, NC, or NP

ARTICULATION, MAJOR, and CERTIFICATION INFORMATION:

AS Degree:	**Area**		Effective:	Inactive:
	C	Natural Sciences	Fall 1983	
CSU GE:	**Transfer Area**		Effective:	Inactive:
	B1	Physical Science	Fall 1983	
	B3	Laboratory Activity		
IGETC:	**Transfer Area**		Effective:	Inactive:
	5A	Physical Sciences	Fall 1983	
	5C	Fulfills Lab Requirement		

CSU Transfer:	Transferable	Effective:	Fall 1983	Inactive:
UC Transfer:	Transferable	Effective:	Fall 1983	Inactive:

CID:

CID Descriptor:PHYS 200S	Calculus-Based Physics for Scientists and Engineers: ABC
SRJC Equivalent Course(s):	PHYS40 AND PHYS41 AND PHYS42 AND PHYS43
CID Descriptor:PHYS 210	Calculus-Based Physics for Scientists and Engineers: B
SRJC Equivalent Course(s):	PHYS42

Certificate/Major Applicable:
Not Certificate/Major Applicable

COURSE CONTENT

Outcomes and Objectives:
Upon completion of the course, the student should be able to:
1. Define the properties of electric charges & electric fields.
2. Solve problems involving Coulombs's Law for point charges & simple continuous charge distributions.
3. Calculate electric fields due to point charges & due to simple continuous charge distribtuions.
4. Describe & explain the motion of charged particles in a uniform electric field & in the oscilloscope.
5. Define electric flux, state Gauss' Law & apply Gauss' Law in determining electric fields for various distributions of charge.
6. Describe the difference between an electrical insulator & an electrical conductor & list of properties of a conductor in electrostatic equilibrium.
7. Define electric potential & potential difference.
8. Determine the potential difference & electric potential in uniform electric fields due to point charges & to uniform charge distributions
9. Obtain E (the electric field vector) from the electric potential.
10. Define capacitance & calculate the capacitance of capacitors with simple geometry.
11. Solve problems involving calculations of capacitors for various combinations of capacitors, & for capacitors with & without dielectrics.
12. Define electric dipole moment & determine the torque on & potential

energy of electric dipole moments in electric fields.
13. Define the concepts of current, current density, drift velocity, resistance, & resistivity; describe the temperature dependence of resistivity; & state Ohm's Law.
14. Solve problems involving resistance, current, voltage & power.
15. Determine the equivalent resistance of resistors in series & parallel to simplify various combinations of resistors.
16. State Kirchhoff's rules & use them to calculate potential & current in various DC circuits.
17. Apply Kirchhoff's rules to RC circuits & describe how the charge & current vary with time.
18. Define the properties of the magnetic field.
19. Calculate the magnetic force on moving charged particles & current carrying conductors in a magnetic field.
20. Describe the motions of charged particles moving in a magnetic field.
21. Use the Biot-Savart Law to calculate the magnetic field produced by a current.
22. State Ampere's Law & apply it in determining magnetic fields.
23. Explain magnetic flux & Gauss' Law for magnetism.
24. Use Faraday's Law of induction to calculate motional emf.
25. State Lenz's Law & apply it to induced currents.
26. State Maxwell's equations.
27. Explain self inductance.
28. Solve problems involving RL circuits, energy in a magnetic field, oscillations in an LC circuit & RLC circuits.
29. Describe the behavior of resistors, inductors & capacitors in AC circuits, & define capacitive reactance, inductive reactance & impedance.
30. Solve for current, voltage, the phase angle between current & voltage, & resonant frequencies in series RLC AC circuits.
31. Explain the operation of a transformer, how a transformer can be either a step-up or step-down transformer, & the role of transformers in AC power transmission.
32. Dicuss Maxwell's equations & the discovery of electromagnetic waves.
33. Use Poynting's vector to calculate the electric field, the magnetic field, the energy, pressure, & momentum associated with an electromagnetic waves.
34. Explain the production of electromagnetic waves by an infinite current sheet & by an antenna.

Topics and Scope:

Topics covered include:
1. Coulomb's Law and electric fields.
2. Gauss' Law.
3. The electric potential.
4. Capacitance and dielectrics.
5. Current, resistance, and Ohm's Law.
6. Direct current circuits and RC circuits using Kirchhoff's rules.
7. Magnetic fields and the forces on moving charges.
8. Sources of magnetic fields Biot-Savart Law and Ampere's Law.
9. Faraday's Law of induction.

10. Self inductance, RL circuits, oscillations in LC circuits and RLC circuits.
11. Alternating current circuits including RLC series and parallel circuits and resonance.
12. Maxwell's equations, electromagnetic waves and Poynting's vector.

Lab work includes:
1. Setting up AC and DC circuits and using a variety of test equipment to analyze them.
2. Constructing an ammeter and voltmeter using a galvanometer.
3. Analyzing AC and DC power supplies.
4. Error analysis.
5. Graphical analysis of data.
6. Measurement of electric and magnetic fields using cathode ray tubes and magnetometers.
7. Analysis of oscillations in RLC circuits.
8. Using the oscilloscope to measure phase angles in AC circuits.

Assignment:

1. Twelve sets of homework problems.
2. Twelve quizzes.
3. Twelve lab reports.
4. No less than 4 mid-term exams.
5. Final exam.

Methods of Evaluation/Basis of Grade:

Writing: Assessment tools that demonstrate writing skills and/or require students to select, organize and explain ideas in writing.

None, This is a degree applicable course but assessment tools based on writing are not included because problem solving assessments are more appropriate for this course.	Writing 0 - 0%

Problem Solving: Assessment tools, other than exams, that demonstrate competence in computational or non-computational problem solving skills.

Homework problems, Lab reports, Quizzes, Exams	Problem solving 20 - 25%

Skill Demonstrations: All skill-based and physical demonstrations used for assessment purposes including skill performance exams.

None	Skill Demonstrations 0 - 0%

Exams: All forms of formal testing, other than skill performance exams.

Multiple choice, PHYSICS PROBLEMS TO SOLVE	Exams 50 - 60%

Other: Includes any assessment tools that do not logically fit into the above categories.

LAB REPORTS	Other Category 20 - 25%

Representative Textbooks and Materials:
PHYSICS FOR SCIENTISTS AND ENGINEERS by Serway.