SAN JUAN COLLEGE
Success Matters

PHYS-1320 CALCULUS-BASED PHYSICS II 1 CREDITS

SYLLABUS

CATALOG DESCRIPTION

A calculus level treatment of classical electricity and magnetism. Recommended co-requisite: PHYS-1320L Calculus-based Physics II Laboratory.

Co-requisites: PHYS 1310 Calculus-based Physics I, minimum grade of C. MATH 1520 Calculus II

Semester Offered: Fall

COMMON STUDENT LEARNING OUTCOMES

Upon successful completion of San Juan College programs and degrees, the student will demonstrate competency in…

BROAD AND SPECIALIZED LEARNING

Students will actively and independently acquire, apply, and adapt skills and knowledge with an awareness of global contexts.

CRITICAL THINKING

Students will think analytically and creatively to explore ideas, make connections, draw conclusions and solve problems.

CULTURAL AND CIVIC ENGAGEMENT

Students will act purposefully, reflectively, and ethically in diverse and complex environments.

EFFECTIVE COMMUNICATION

Students will exchange ideas and information with clarity in multiple contexts.

INFORMATION LITERACY

Students will be able to recognize when information is needed and have the ability to locate, evaluate, and use it effectively.

INTEGRATING TECHNOLOGIES

Students will demonstrate fluency in the application and use of technologies in multiple contexts.

Student work from this class may be randomly selected and used anonymously for assessment of course, program, and/or institutional learning outcomes. For more information, please refer to the Dean of the appropriate School.

COURSE LEARNING OUTCOMES

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

1. Apply the concepts of electric charge, electric field and electric potential to solve problems**.**
2. Sketch the electric field in the vicinity of point, line, sheet, and spherical distributions of static electric charge**.**
3. Sketch the magnetic field in the vicinity of line, ring, sheet, and solenoid distributions of steady current**.**

4. Describe the relationship between electric field and electric potential**.**
5. Calculate the Lorentz force on a moving charge for simple geometries of the fields and use it to analyze the motion of charged particles**.**
6. Apply the integral forms of Maxwell's equations**.**
7. Calculate the energy of electromagnetic fields**.**
8. Analyze DC circuits**.**

SPECIFIC LEARNING OUTCOMES:

1. List the three fundamental properties of charge.
2. Find the net force acting on a charged particle placed in an electric field.
3. Identify similarities between The Law of Gravitation and Coulomb's Law.
4. Calculate the magnitude and directions of an electric field at a given point in for a static distribution of charged particles.
5. Sketch electric field lines for pairs of like and unlike charges.
6. Using calculus calculate the magnitude and direction of an electric field, at a given point in space, for continues charge distribution.
7. Use surface integrals to calculate electric flux.
8. Discuss the advantages and the disadvantages of Gauss' Laws.
9. Apply Gauss' Law to symmetric charge distributions.
10. Distinguish between electric potential energy and electric potential.
11. Calculate potential energy for a group of charges.
12. Identify several uses for a capacitor.
13. List three methods for changing a capacitor's capacitance.
14. Distinguish between polar and non-polar dielectrics.
15. Explain the difference between resistance and resistivity.
16. Apply Ohm's Law to circuits.
17. Calculate the power of a home appliance.
18. Build a simple DC circuit.
19. Use an ammeter and voltmeter to measure current, voltage, and resistance in simple DC and AC circuits.
20. Build an ammeter.
21. Calculate magnitude and direction of the force on a charged particle moving in a magnetic field.
22. Using calculus calculate the magnetic flux through a surface.
23. Measure the magnetic forces and torques on a current carrying conductor immersed in an external magnetic field.

24. Apply the Biot-Savart Law in vector form to a current carrying conductor.
25. Recognize the advantages and disadvantages of using Ampere's Law.
26. Explain how a transformer works on the principles of Faraday's Law and Lenz's Law.
27. Find the resonant frequency of a simple LRC circuit.
28. Find a connection between Maxwell's equations and the production of EM waves.
29. Calculate the various parameters related to EM waves such as frequency, wavelength, energy transport, state of polarization, etc.
30. Recognize the implication of a displacement current and its role in the analysis of a electromagnetic (EM) wave.