Centre for High Energy Physics
Faculty of Science
University of the Punjab, Lahore

Course Outline

Program	BSCP	Course Code	CPHY 221	Credit Hours	3

Course Title	Electricity and Magnetism

Course Introduction

This course introduces the fundamental concepts of electric charge, electric force, and electric fields, using hand-drawn animations. This is excellent for students who are taking a physics class but need extra help understanding the material, whether it's because your teacher is hard to understand, you miss some lectures, or you'd simply like a fresh perspective.

Learning Outcomes

1. Understand basic principle of electricity and magnetism and its applications.
2. Be able to solve relevant numerical problems.

Course Content

Week 1	Coulomb's law; Electric Field, Gauss's law and its applications
Week 2	Electric field due to surface and volume charge distribution, electric field due to dipole
Week 3	Electric potential, Potential due to point charge, due to collection of point charges surface and volume charge distribution. Poisson's and Laplace equation (without solution)
Week 4	Capacitance, Calculating capacitance
Week 5	Energy storage in an electric field, Capacitor with dielectric, Dielectrics and Gauss's Law. Electric current & density
Week 6	Ohm's law, microscopic view of Ohm's law. DC Circuits
Week 7	Calculating current in a single loop & multiple loops, Use of Kirchhoff's 1st and 2nd law, Thevenin and Norton theorems
Week 8	Transient behavior of RC circuit. Magnetic force on a charge particle and a current carrying wire, Torque on a current Loop
Week 9	The Hall Effect, Ampere's Law
Week 10	The Bio-Savart Law and its applications, Solenoids and Toroids
Week 11	Faraday's law of induction, Lenz's Law, Motional emf
Week 12	Induced electric fields. Magnetic properties of materials, magnetization. Inductance

Week 13	LR Circuit (transient behavior). AC current
Week 14	AC current in resistive, inductive and capacitive elements
Week 15	RLC series and parallel circuits
Week 16	Maxwell's Equations

Textbooks and Reading Material

1. Physics Vol.1 (4^{th}edition), Halliday and Resnic, *John Wiley and Sons* (1992).
2. Physics Vol.1 (5^{th}edition), Halliday and Resnic, *John Wiley and Sons* (2002).
3. Fundamentals of Physics (5^{th}edition), Halliday&Resnic, *John Wiley and Sons* (1999).
4. Physics for Scientists and Engineers (extended version), P. M. Fishbane, *Prentice-Hall International Editions* (2016).
5. Foundations of Electromagnetic Theory (3^{rd}edition), J. R. Reitz, *Narosa Publishing House* (1997).

Teaching Learning Strategies

The instructor is required to make use of examples of the text books and The students are required to solve a large portion of related exercises/questions/problems of the main textbooks.

Assignments: Types and Number with Calendar

At least two assignments and two quizzes. A course project may also be assigned.

Assessment

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on-activities, short tests, projects, practical, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. At least fifty percent of the question paper would involve new problems related to the concepts learned in the course. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, field work and report writing etc.