Faculty of Science
University of the Punjab, Lahore
Course Outline

Program	BSCP	Course Code	CPHY 322	Credit Hours	3
Course Title	Electromagnetic Theory I				

Course Introduction
The course introduces electromagnetic theory at undergraduate level.

Learning Outcomes
On the completion of the course, the students will: 1. Solve advance problems of electromagnetism. 2. Apply Maxwell's equation to explain various wave phenomena. 3. Solve simple problems of electrodynamics. 4. Introduce covariant form of Maxwell's equations.

Course Content	
Week 1	Introduction of classical electrodynamics and its scope
	Electrostatics: Coulomb's law, the electric fields
Week 2	Divergence and curl of electric field
	Differential form of Gauss's law
Week 3	The electric flux, The electric potential
	Electric potential of charge distributions
Week 4	(Problem Solving)
	The electric dipole
Week 5	Multipole expansion
	Electric potential energy of system of charges
Week 6	Electric potential energy of a continuous distribution
	Potential energy stored in the electric field
Week 7	Poisson's and Laplace's equations
	Properties of solution of Laplace's equation
Week 8	Solution of Laplace's equation in 2D Cartesian
	Solution of Laplace's equation in polar coordinates
Week 9	(Problem Solving)
	Electrostatic Field in Dielectric Media
Week 10	Polarization
	Field outside a dielectric medium
Week 11	Electric field inside a dielectric

	Gauss's law in a dielectric, Electric susceptibility and dielectric constant
Week 12	Boundary conditions on the field vector at the interface b/w different medium
	(Problem Solving)
Week 13	Magnetostatics: Forces on a current carrying system
	Torque on a loop of wire
Week 14	Steady current, Equation of continuity.
	Biot and Savart law and its applications
Week 15	Divergence and curl of magnetic field
	Differential form of Ampere's law and Magnetic flux
Week 16	Magnetic vector potential and Coulomb's gauge
	Magnetic field of a distant circuit.

Textbooks and Reading Material

1. Classical Electrodynamics, Jackson, *Wiley* (1975).
2. Foundations of Electromagnetic Theory (4rdedition), Addison-Wesley (2008).
3. Introduction to Electrodynamics (2ndedition), D. Griffiths, *Prentice Hall* (1989).
4. Electromagnetic Theory, S. J. Adams, *Adams Press* (2008).

Teaching Learning Strategies

The instructor is required to make use of Mathematica/Maple/Python to teach the concepts through visualization/antimutation and symbolic/numerical calculations. 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. 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.