

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



Program	BSCP	Course Code	CPHY 323	Credit Hours	3
Course Title	Electromagnetic Theory II				
Course Introduction					
The course introduces electromagnetic theory at undergraduate level.					
Learning Outcomes					
On the completion of the course, the students will:					
<ol style="list-style-type: none"> 1. Solve advance problems of electromagnetism. 2. Apply Maxwell's equation to explain various wave phenomena. 3. Solve simple problems of electrodynamics. 4. Learn covariant form of Maxwell's equations. 					
Course Content					
Week 1	Magnetic properties of Matter				
	Magnetization				
Week 2	Magnetic field produced by a magnetized material				
	Magnetic scalar potential				
Week 3	(Problem solving)				
	Ampere's law in a magnetic material				
Week 4	Magnetic intensity				
	Magnetic susceptibility and permeability				
Week 5	Ferromagnetism, Hysteresis				
	(Problem solving)				
Week 6	Boundary conditions on the field vector at the interface b/w different medium				
	Faraday law of electromagnetic induction and its differential form.				
Week 7	Energy density in the magnetic field.				
	(Problem solving)				
Week 8	Maxwell's Equations				
	Poynting's theorem				
Week 9	(Problem solving)				
	Maxwell's equation in a material, General boundary condition of electromagnetic field.				
Week 10	The wave equation of electromagnetic field in free space and its plane wave solutions.				
	(Problem solving)				

Week 11	Spherical waves
	Propagation of electromagnetic wave in a conductive material
Week 12	Reflection and refraction at the boundary of two non-conducting media (normal incidence)
	Reflection and refraction at the boundary of two non-conducting media (oblique incidence)
Week 13	Brewster's angle
	Reflection from a conducting plane
Week 14	The radiation from an oscillating dipole
	Parallel plate wave guide.
Week 15	(Problem solving)
	Covariant formulation Maxwell's equation
Week 16	(Continuing previous topic)
	(Problem solving)

Textbooks and Reading Material

1. Classical Electrodynamics, Jackson, *Wiley* (1975).
2. Foundations of Electromagnetic Theory (4rd edition), Addison-Wesley (2008).
3. Introduction to Electrodynamics (2nd edition), 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/animation 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.