PHY7205: CLASSICAL ELECTRODYNAMICS I 2(2-0)

1. Course Name: Classical Electrodynamics I

2. Course Code: PHY7205

3. Credit Units: 2

4. Course Description:

This course builds on the undergraduate course of Electromagnetism, starting with simple theories in electrostatics. The continuity and Maxwell's equations are then introduced, leading to the Poynting's vector and conservations laws.

5. Course Objectives:

At the end of the course, the students should be able to:

- Use the method of images to get electrostatic energy.
- Derive the continuity equation.
- Solve the wave equation in time varying fields.
- Discuss waves in a conducting media and in a plasma.

6. Course Outline:

Content	Hours
Electrostatics: Coulomb's law; Method of Images; Multiple expansions; Boundary value problems; Polarizability; Electrostatic energy.	10
Magnetostatics: Continuity equation; Ampere's law; Vector potential; Macroscopic equations; Boundary conditions on **B** and **H** fields.	10
Time varying fields: Maxwell's equations; Energy in a magnetic field; Solution of the wave equation; Poynting's vector and conservation laws; Retarded potentials.	15
Plane waves: Plane waves and polarization of **E** and **B;** General solution; Energy density; Reflection and Refraction; Waves in a conducting medium and in a plasma (brief discussion).	10

Total	**45**

7. Delivery:Mode of

This course will consist mainly of lecture sessions.

8. References:

1. Jackson, J. D.: Classical Electrodynamics (1998): (3rd Edition. John Wiley & Sons, New York.

2. Landau, L. D., and E. M. Lifshitz. The Classical Theory of Fields (1980). Elsevier Science Ltd, Burlington