

1.	Title of the Course	Classical Electrodynamics
2.	Course Number	PH5105
3.	Status of the Course	Core
4.	Structure of Credits	3-1-0-4
5.	Offered To	PG
6.	New Course/Modification to	New
7.	To be Offered by	Department of Physics
8.	To take effect from	July 2020
9.	Prerequisite	Nil
10.	Whether approved by the Department	Yes
11.	<p>Course Objective: To equip students with advanced knowledge in understanding the principles and dynamics of electromagnetic phenomena that occur in static and time-varying sources. To acquire necessary mathematical knowledge for detailed description of these phenomena required for solving related problems. To acquire a sense of unity in Physics at a fundamental level by embracing the concepts of special theory of relativity as emergent through the laws of electrodynamics.</p>	
12.	<p>Course Content: Helmholtz and uniqueness theorem; Poisson and Laplace equations, Dirichlet and Neumann boundary conditions; Boundary value problems and Green's function formalism; Method of images; Multipole expansion, electromagnetic fields in matter; Maxwell's equations, gauge transformations, energy, momentum and angular momentum of fields, Poynting's theorem; Electromagnetic waves: wave propagation in dielectrics and conductors, dispersion, absorption, Kramers-Kronig relations; Waveguides; Special theory of relativity: 4-formalism, Lorentz transformation, space-time diagrams; Field produced by a uniformly moving charged particle and accelerating charged particle, Lienard-Wiechert potentials, dipole radiation, Larmor formula, synchrotron radiation, radiation losses, radiation reaction, Abraham-Dirac-Lorentz equation; Scattering: Rayleigh and Mie, critical opalascence.</p>	
13.	<p>Text book(s): 1. Griffiths D J, <i>Introduction to Electrodynamics</i>, Pearson Education India Learning Private Limited (2015). 2. Jackson J D, <i>Classical Electrodynamics</i>, Wiley (2007).</p>	
14.	<p>Reference(s): 1. Deshmukh P C, <i>Foundations of Classical Mechanics</i>, Cambridge University Press (2019). 2. Landau L D and Lifschitz E M, <i>The classical theory of fields (Vol. 2: Course of Theoretical Physics)</i>, Butterworth-Heinemann (1987). 3. Panofsky W K H and Phillips M, <i>Classical Electricity and Magnetism</i>, Sarat Book House (2006). 4. Zangwill A, <i>Modern Electrodynamics</i>, Cambridge University Press (2012).</p>	