First Semester 2015-2016

Date: 03/08/2015

Course No.: PHY F424

Course Title: Advanced Electrodynamics

Instructor-in-Charge: Amol Holkundkar

Scope and Objective:

This course offers an advanced and application oriented overview of the field of electrodynamics.

Text Books:

1. Classical Electrodynamics, J D Jackson, 3rd Edition, Wiley Student Edition

Reference Books:

1. Introduction to Electrodynamics, D J Griffith.
2. Electrodynamis, F Melia.
3. Computational Electrodynamics, A Taflov and S C Hagness

Course Plan:

Lect. No.	Topics to be covered
1 - 5	Review of Maxwell's equations: Maxwell's equations, scalar and vector potentials, gauge transformations of the potentials, the electromagnetic wave equation, retarded and advanced Green's functions for the wave equation and their interpretation
6-10	Special Theory of Relativity, Electromagnetic Field Tensor, Covariant formulation of electrodynamics
11-17	Dynamics of relativistic particles and EM fields: Lagrangian of a relativistic charged particle in an EM field, motion in uniform, static electromagnetic fields, Lagrangian of the EM fields, Phase Space Portrait of Charge Particle in EM field.

18-23	Radiation by moving charges – Lienard-Wiechert potentials and fields, Larmor's formula and its relativistic generalization;
24-29	Radiation damping – radiative reaction force from conservation of energy, Abraham-Lorentz model n inversion, Einstein's coefficients, threshold requirements for laser
30-35	Interaction of EM fields with charge fluid, wakefield generation and accceleration, Contempory field of research in this fields
36-40	Computational Electrodynamics an Introduction : FDTD, absorbing boundary conditions, yee algorithm.

Evaluation Scheme:

No.	Evaluation Component	Duration	Weightage	Date & Time
1	Tutorials/Assignments	30 mins	30%	Announced
2	Mid-Term (Close book)	90 Mins	30%	7/10 2:00 - 3:30 PM
3	Compre. Exam. (Close/Open book*)	3 Hrs	40%	7/12 FN

***Open Book**: Only the books listed in the handout and handwritten notes allowed. **Chamber Consultation Hours**: To be announced in the class.

Notices: Will be uploaded on Intrabits site only.

Make-up Policy: Make-up will be given only in genuine cases, that is, illness leading to hospitalization or going out of station with prior permission. No make-ups for the tutorials.

Instructor-in-charge