STELLA MARIS COLLEGE (AUTONOMOUS), CHENNAI

Course Schedule: June - November 2023

Department : Physics

Name/s of the Faculty : Dr. K. Sownthari

Course Title : Electrodynamics

Course Code : 19PH/PC/ED34

Shift : II

Week & No. of hours	Units & Topics	Teaching Methodology	Text & References	Method of Evaluation
June 19 – June 26, 2023 (Day Order 1 to 6)	**Unit 1 Electric and Magnetic Potential** Divergence and curl of E - Electric scalar potential - Poisson's and Laplace's equations - uniqueness theorems - potential of a localised charge distribution - electric potential - energy of a continuous charge distribution-multipole expansion: approximate potentials at large distances – monopole and dipole terms	Power point Lectures	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Discussion and problem solving
June 27 – July 04, 2023 (Day Order 1 to 6)	electric dipole moment - electric field of a dipole. Divergence and curl of B - Energy in the magnetic fields due to current carrying elements - Magnetic vector potential – magnetic potential at any point due to current carrying elements – multipole expansion of the vector potential - magnetic dipole moment - magnetic field of a dipole.	Lecture	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Discussion and problem solving
July 05– July 12, 2023 (Day Order 1 to 6)	**Unit 2 Electromagnetic Waves** Maxwell's equation in free space and in matter, displacement current, boundary conditions, Gauge transformations - Coulomb and Lorentz gauge - momentum - Poynting's theorem, - Polarisation	Power point Lectures	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Discussion and problem solving
July 13 – July 20, 2023 (Day Order	monochromatic plane waves - energy and momentum in electromagnetic waves. Propagation in linear media - reflection and transmission at (i) normal incidence (ii) oblique incidence - laws of geometrical	Power point Lectures	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition,	Discussion and problem solving

1 to 6)	optics - Fresnel's equation - Brewster's angle		Prentice Hall (1999)	
July 21 – July 28, 2023 (Day Order 1 to 6)	**Unit 3 Relativistic Electrodynamics:** Four vectors - tensor algebra, Lorentz transformation - invariance of Maxwell's equations under Lorentz transformation - transformation of electromagnetic field intensities - electromagnetic field tensor	Lecture and seminar	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Third Component test
July 31 – Aug 03, 2023 (Day Order 1 to 4)	electromagnetic field invariants - covariant form of Maxwell's equations – electromagnetic energy - momentum tensor, conservation laws of vacuum electrodynamics.	Lecture and seminar	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Third Component test
Aug 04 – Aug 09, 2023	**C.A. Test – I**			
Aug 10 – Aug 11, 2023 (Day Order 5 to 6)	Relativistic Lagrangian for a free particle - energy - momentum of a free particle - Lagrangian and Hamiltonian for a charged particle in an electromagnetic field.	Lecture and seminar	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Third Component problem solving
Aug 14 – Aug 22, 2023 (Day Order 1 to 6)	**Unit 4 Electromagnetic radiation:** Retarded scalar and vector potentials - Lienard - Wiechert potentials for a moving point charge -	Power point Lectures	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Discussion and problem solving
Aug 23 – Aug 31, 2023	electric and magnetic fields of a moving point charge, velocity and acceleration fields. Electric dipole radiation	Power point	David Jeffery Griffiths, Introduction to electrodynamics,	Discussion and problem

(Day Order 1 to 6)		Lectures	3rd edition, Prentice Hall (1999)	solving
Sept 01 – Sept 11, 2023 (Day Order 1 to 6)	magnetic dipole radiation - radiation from an arbitrary source - power radiated by a point charge – Larmor formula -	Power point Lectures	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Discussion
Sept 12 – Sept 19, 2023 (Day Order 1 to 6)	Lienard's generalization of the Larmor formula – radiation reaction - Abraham Lorentz formula.	Power point Lectures	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Questioning
Sept 20 - Sept 27, 2023 (Day Order 1 to 6)	**Unit 5 Guided waves and magneto hydrodynamics (MHD):** Essential conditions for guided waves - TEM waves in coaxial cables - TE waves-	Power point Lectures	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Questioning
Sept 29 – Oct 03, 2023 (Day Order 1 to 3)	rectangular wave guide - electric and magnetic fields on the surface and inside rectangular wave guide	Power point Lectures	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Questioning
Oct 04 – Oct 09, 2023	**C.A. Test – II**			
Oct 10 – Oct 12,	TE and TM waves in rectangular wave	Power point	David Jeffery Griffiths,	Questioning

2023 (Day Order 4 to 6)	guide - cut - off frequency and wavelength	Lectures	Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	
Oct 13 – Oct 20, 2023 (Day Order 1 to 6)	circular waveguides - energy flow and attenuation in wave guides – cavity resonators	Power point Lectures	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Questioning
Oct 25 – Oct 27, 2023 (Day Order 1 to 3)	phase and group velocity MHD - Definitions – magneto hydrodynamic equations - magnetic diffusion - viscosity and pressure	Power point Lectures	David Jeffery Griffiths, Introduction to electrodynamics, 3rd edition, Prentice Hall (1999)	Questioning
Oct 28- Nov 04, 2023	**REVISION**			