

Electrodynamics

Govind Menon

1. Introduction to Vectors
2. Cross Product
3. The Gradient
4. The Line Integral
5. Divergence and Curl
6. (a) Cylindrical and Spherical CS
(b) Cylindrical CS Divergence
(c) Stokes Thm Example
7. The Delta Function
8. Delta Function continued
9. Sample Problems
10. Helmholtz Theorem
11. The Electric Field
12. Electric field outside a charged shell
13. Gauss's Law
14. Curl of E
15. The Electric Potential
16. Boundary Conditions
17. Energy in Electrostatics
18. (a) Conductors
(b) Electrostatic Energy Example
19. Capacitance
20. Energy Stored in a Capacitor
21. Maxima and Minima of Potentials
22. Uniqueness Theorems
23. Image Charges
24. Laplace's Equation I
25. Laplace's Equation II
26. Laplace's Equation III
27. Laplace's Equation IV
28. The Electric Dipole
29. Multipole Expansion
30. Force and Torque on a Dipole
31. Problems 4.5 and 4.29
32. Dielectric Materials
33. Linear Dielectric Materials
34. Example 4.7
35. Example 4.8
36. Energy Stored in a Dielectric
37. Capacitors with a Dielectric
38. The Magnetic Field
39. Work and Magnetism
40. Biot Savart's Law
41. Ampere's Law
42. Ampere's Law Contd
43. Vector Potential
44. Vector Potential Contd.

- | | |
|---|---|
| 45. Boundary Conditions | 59. Superconductivity |
| 46. Multipole Expansion | 60. Work Energy Theorem in Electrodynamics |
| 47. Force and Torque on a Magnetic Dipole | 61. Maxwell Stress Tensor |
| 48. Bound Currents | 62. Electromagnetic Momentum |
| 49. Magnetism | 63. Angular Momentum |
| 50. Linear Media | 64. Magnetic Forces do no Work |
| 51. Magnetostatic Boundary Conditions | 65. The Wave Equation |
| 52. Ohmic Materials | 66. Waves on a String |
| 53. Motional EMF | 67. Electromagnetic Waves |
| 54. Faraday's Law of Induction | 68. Plane Waves |
| 55. Induction Examples | 69. Reflection & Refraction Normal Incidence |
| 56. Inductance | 70. Reflection & Refraction Oblique Incidence |
| 57. Maxwell's Equations | 71. Reflection & Refraction Oblique Incidence |
| 58. Electromagnetism in Matter | 72. EM Waves in Conductors |

June 12, 2025