

**PHY 552: Classical Electrodynamics I**  
**Department of Physics, I.I.T. Kanpur**  
**2011-2012, Semester I**

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**Instructor** Dr. S. Anantha Ramakrishna,

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**Course Webpage:** <http://home.iitk.ac.in/~sar/EMT552>

**Schedule:** Lectures Mon, Wed, Thu (8.00 -9.00 hours in L10); Tutorial Fri (1100-1200 hours) in L10

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**Textbooks**

1. J.D. Jackson, *Classical Electrodynamics*, 3<sup>rd</sup> Edition, (John Wiley, Singapore, 1999)
  2. L.D. Landau, E.M. Lifschitz and L.P. Pitaevskii, *Electrodynamics of continuous media*, 2nd Ed. (Pergamon Press Oxford, 1999).
  3. W. Greiner, *Classical Electrodynamics*, (Springer-Verlag, New York, 1998) - Indian reprint
  4. D.J. Griffiths, *Introduction to Electrodynamics* (Pearson Education, 2002)
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**Course contents**

1. Review of Coulomb's law and electrostatics
  2. Laplace and Poisson equations, uniqueness theorems
  3. Solutions of boundary value problems: method of images, separation of variables, Green's functions
  4. Dielectric materials
  5. Magnetostatics with steady currents
  6. Magnetizable materials
  7. Lorentz force, dynamics of charged particles in constant electric and magnetic fields
  8. Time varying fields, *emf*, quasistatic approximations
  9. Maxwell's equations
  10. Electromagnetic waves in free space
  11. Energy and momentum of EM waves, Poynting theorem, Maxwell stress tensor
  12. Gauge transformation, Gauge invariance and electromagnetic potentials
  13. Electromagnetic waves in dispersive media
  14. Lorentz theory of dispersion and local field effects
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**Evaluation:**

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| 1. Quizzes (surprise)       | : 15 % |
| 2. Mid-semester Examination | : 35 % |
| 3. End-Semester Examination | : 50 % |

Attendance is compulsory. Any absence can be condoned only when you have obtained official leave from the DUGC.