Electricity and Magnetism PHYS-340, 2014

Instructor: Shaun Lovejoy, Rutherford Physics, Rm. 213, local 6537, email: lovejoy@physics.mcgill.ca,
Monday, Wednesday, Friday 8:35-9:25 pm, Rutherford 114.

Office Hours: TBA

Teaching assistants:
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Math background: **Prerequisites**: Math 222A,B (Calculus III= multivariate calculus), 223A,B (Linear algebra), **Corequisites**: **314A** (Advanced Calculus = vector calculus), 315A (Ordinary differential equations).

Primary Course Book: "Introduction to Electrodynamics" by D. J. Griffiths, Prentice-Hall, (2013, fourth edition).
Similar books:
-"Electromagnetism", G. L. Pollack, D. R. Stump, Addison and Wesley, 2002.
-"Electromagnetic fields" by R. K. Wangsness, 1979, John Wiley and Sons,
-"Classical Electromagnetism" by R. H. Good, 1999, Harcourt Brace College publishers.
-"Electromagnetic fields and waves" by P. L. Lorrain, D. P. Corson, F. Lorrain, 1988 (3rd edition) W. H. Freeman and co., New York.
Reference: "Classical Electrodynamics", J.D. Jackson, 1998 Wiley.

Outline:

1. Vector Analysis:
   Algebra, differential and integral calculus, curvilinear coordinates, Dirac δ function, potentials.
2. Electrostatics:
   Definitions, basic notions, laws, divergence and curl of the electric potential, work and energy.
3. Special techniques:
   Laplace's equation, images, seperation of variables, multipole expansion.
4. Electrostatic fields in matter:
   Polarization, electric displacement, dielectrics.
5. Magnetostatics:
   Lorenz force law, Biot-Savart law, divergence and curl of B, vector potentials.
6. Magnetostatic fields in matter:
   Magnetization, field of a magnetic object, the auxiliary field H, magnetic permeability, ferromagnetism.
7. Electrodynamics:
   Electromotive force, Faraday's law, Maxwell's equations.