TEST THREE Thursday Evening May 10 from 7:30-9:30 pm. The Friday class immediately following is canceled because of the evening exam. Please see announcements for room assignments for Exam 3.

What We Expect From You On The Exam

(1) The ability to calculate the inductance of specific circuit elements, for example that of a long solenoid with N turns, radius a, and length L.

(2) An understanding of current flow in a resistive material, e.g. how **J** is related to I, how **E** is related to **J**, how resistance is related to resistivity, and how to calculate it.

(3) An understanding of simple circuits. For example, you should be able to set up the equations for multi-loop circuits, using Kirchhoff's Laws. You should be able to derive and guess the solution to differential equations for both RL and RC circuits, and should understand the meaning of time constants ($\tau = L/R$, $\tau = RC$)

(4) An understanding of the concept of energies stored in magnetic fields, that is $U = \frac{1}{2}LI^2$ for the total magnetic energy stored in an inductor, and $u_B = \frac{1}{2\mu_0}B^2$ for the energy density in magnetic fields. You also should review the concept of energies stored in electric fields, that is $U = \frac{1}{2}CV^2 = \frac{1}{2C}Q^2$ for the total electric energy stored in a capacitor, and $u_E = \frac{1}{2}\varepsilon_0 E^2$ for the energy density in electric fields.

(5) An understanding of the nature of the *free* oscillations of an RLC circuit.

(6) An understanding of the nature of the *driven* oscillations of an RLC circuit.

(7) An understanding of Maxwell's equations, including Maxwell's addition to Ampere's Law (displacement current). You should be able to produce and identify each of Maxwell's equations, as well as give <u>brief</u> explanations of the meaning and use of each of them (don't be surprised by a question like "State each of Maxwell's equations and briefly explain their meaning and typical use.")

(8) An understanding of electromagnetic radiation. In particular, an ability do to analytic and conceptual problems related to plane EM waves — e.g. obtain **E** given **B** and vice versa, determine the direction of propagation, and so on.

(9) An understanding of the Poynting vector and energy transport.

To study for this exam we suggest that you review your problem sets, in-class problems, Friday problem solving sessions, PRS in-class questions, and relevant parts of the study guide and class notes.