PHYS 212 MWF 9:30-10:20    S2010 Study Guide for Final
Final exam will consist of multiple choice questions, regular questions, derivations, and problems. It will cover the materials from Tests 2, 3, & 4 and Chapter 30.

Tests 2, 3, & 4 Study old Tests 2,3,and 4.

Chaps 21, 22, & 23:
Understanding and using Coulomb’s law ( ) in problem solving.
Understanding and using Gauss’ Law ($∮\_{}^{}\vec{E}∙\vec{dA}=q\_{enc}$) in problem solving.

Defining electric field and determining the net electric field due to multiple point charges.
 
Determining strength and polarity of electric charges from electric field lines.

Chaps 24, 25, & 26:

1. **Capacitors: ** ****
2. Current (i), current density (J), resistance (R), and power (P):

   
Ohm’s law: v = iR Power:   

Chap 27:



Analyzing circuits using loop rule and junction rule.

Chap 28: Net force on a moving charge in electric and magnetic fields: $\vec{F}=q\vec{E}+q\vec{v}×\vec{B}$

A Charged Particle Circulating in a Magnetic Field:

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| **Chap 29: Magnetic Field of a Long Straight Wire:**http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c29/math011.gifhttp://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c29/math069.gif |
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**Chapter 30: Magnetic Flux** The *magnetic flux* through an area *A* in a magnetic field is defined as



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|  |   (30-1) |
| http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif |

where the integral is taken over the area. The SI unit of magnetic flux is the weber, where 1 . If is perpendicular to the area and uniform over it, Eq. [30-1](http://edugen.wiley.com/edugen/courses/crs1650/reference/xlinks/halliday8019c30xlinks.xform?id=halliday8019c30-mdis-0117) becomes

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| http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math256.gif |   (30-2) |
| http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif |

**Faraday's Law of Induction** If the magnetic flux through an area bounded by a closed conducting loop changes with time, a current and an emf are produced in the loop; this process is called *induction*. The induced emf is

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| http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math257.gif |   (30-4) |
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If the loop is replaced by a closely packed coil of *N* turns, the induced emf is

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| http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math258.gif |   (30-5) |
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**Lenz's Law** An induced current has a direction such that the magnetic field *due to the current* opposes the change in the magnetic flux that induces the current. The induced emf has the same direction as the induced current.

**Inductors** An **inductor** sis a device that can be used to produce a known magnetic field in a specified region. If a current *i* is established through each of the *N* windings of an inductor, a magnetic flux links those windings. The **inductance** *L* of the inductor is

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The SI unit of inductance is the **henry** (H), where . The inductance per unit length near the middle of a long solenoid of cross-sectional area *A* and *n* turns per unit length is

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| http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math125.gif |   (30-31) |
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| **Self-Induction** If a current *i* in a coil changes with time, an emf is induced in the coil. This self-induced emf is http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif |
| http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math263.gif |   (30-35) |
| http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif |

The direction of is found from Lenz's law: The self-induced emf acts to oppose the change that produces it.

**Series *RL* Circuits** If a constant emf is introduced into a single-loop circuit containing a resistance *R* and an inductance *L*, the current rises to an equilibrium value of according to

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| http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math264.gif |   (30-41) |
| http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif |
| Here http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math158.gif is called the **inductive time constant** of the circuit.  |   (30-49) |
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