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 () 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: http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c25/math127.gif**http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c25/math132.gif **http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c25/math133.gif**
2. Current (i), current density (J), resistance (R), and power (P):

http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c26/math136.gif http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c26/math138.gif http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c26/math143.gif http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c26/math057.gif  
Ohm’s law: v = iR Power: http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c27/math039.gif http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c27/math158.gif http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c27/math159.gif

Chap 27:

http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c27/math160.gifhttp://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c27/math063.gif

Analyzing circuits using loop rule and junction rule.

Chap 28: Net force on a moving charge in electric and magnetic fields:

A Charged Particle Circulating in a Magnetic Field:http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c28/math156.gif

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| **Chap 29: Magnetic Field of a Long Straight Wire:**  http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c29/math011.gif  http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c29/math069.gif | | |
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**Chapter 30: Magnetic Flux** The *magnetic flux* http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math008.gifthrough an area *A* in a magnetic field http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math002.gifis defined as



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| http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif | |
|  | (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 http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math255.gif. If http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math027.gifis 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/common/pixel.gif | |
| 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 http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math008.gifthrough 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/common/pixel.gif | |
| http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math258.gif | (30-5) |
| http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif | |

**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 http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math008.giflinks those windings. The **inductance** *L* of the inductor is

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| http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif | |
| http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math261.gif | (30-28) |
| http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif | |

The SI unit of inductance is the **henry** (H), where http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math262.gif. 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) |
| http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif | |

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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 http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math130.gifis found from Lenz's law: The self-induced emf acts to oppose the change that produces it.

**Series *RL* Circuits** If a constant emf http://edugen.wiley.com/edugen/courses/crs1650/art/images/emf.gifis introduced into a single-loop circuit containing a resistance *R* and an inductance *L*, the current rises to an equilibrium value of http://edugen.wiley.com/edugen/courses/crs1650/art/math/halliday8019c30/math142.gifaccording to

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| http://edugen.wiley.com/edugen/courses/crs1650/art/common/pixel.gif | |
| 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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