PHYS 0175 Learning Objectives

1. Use Coulomb's law to calculate the forces between two or more point charges.
2. Describe how charge redistributes itself as conductors are touched to insulators, other conductors, and/or grounded.
3. Calculate the electric field due to one or more point charges.
4. Integrate to find the electric field due to an extended charge distribution (line, arc, or ring).
5. Describe the behavior of a dipole placed in an electric field (in terms of torque and potential energy).
6. Find the electric field due to a symmetric extended charge distribution using Gauss's law. Alternately, determine the amount of induced charge on the surface(s) of a conductor.
7. Calculate the electric potential due to a system of point charges.
8. Sketch the electric field and/or potential for a charge distribution.
9. Integrate to determine the electric potential from a continuous charge distribution (line, arc, or ring).
10. Use the relationship between electric potential and electric field to convert from one to the other.
11. Determine the potential energy of (or the work needed to assemble) a system ofcharges.
12. Find the energy stored in a capacitor's electric field.
13. Describe the effects of dielectrics on capacitors in terms of the electric field, capacitance, and energy stored in the capacitor.
14. Determine the charge, capacitance, or voltage of one or more capacitors in series andparallel.
15. Convert between current, current density, and drift velocity.
16. Apply the definitions of resistance and resistivity, and convert between the two.
17. Find the power dissipated by a resistor in a circuit.
18. Apply Kirchhoff's laws to a single-loop or multi-loop circuit to find the current(s). Circuits may include ideal or real batteries.
19. Calculate the voltage between two points in a circuit.
20. Determine the equivalent resistance, current, or voltage for resistors in series andparallel.
21. Find the time constant, current, and/or voltage of a capacitor in an RC circuit at a particular time.
22. Find the force on a moving charged particle due to a magnetic field.
23. Apply the ideas of crossed fields and/or centripetal motion to solve for an unknown given a set of measurable quantities. Examples include Tompson's apparatus and the Hall effect.
24. Determine the magnitude and direction of the force acting on current carrying wires.
25. Calculate the magnetic field of one or more wires (including solenoids and toroids) using the Biot-Savart law or Ampere's Law.
26. Sketch the magnetic field of one or more wires (including solenoids and toroids).
27. Calculate the magnitude and direction of an induced current from a changing magneticflux.
28. Determine the inductance or mutual inductance of a system.
29. Find the current at a particular time in an RL circuit.

30. Calculate the energy stored in the capacitor/inductor in an LC or undriven RLC circuit.
31. Find resistance, capacitance, inductance, reactance, impedance, phase angle, power factor, current amplitude, and/or voltage amplitude in an RLC circuit.
32. Know the relationships between phase, resonance, and terms like "capacitive."
33. Determine the average power produced by a generator and/or dissipated by one or more resistive loads.
34. Calculate the voltage, current, and/or equivalent resistance transformations of an ideal transformer and identify the circumstances where maximum power is transfered from a source to a load.
35. Calculate the displacement current and/or induced magnetic field from a changing electric flux.
36. Determine the energy transported by an electromagnetic wave and/or the amplitudes of the electric and magnetic fields.
37. Calculate the angle of reflected and/or refracted light rays, and identify total internal reflection.
38. Evaluate the intensity of a light source after it passes through one or more polarizers. The light source could be polarized by reflection at Brewster's angle.
39. Locate the maxima or minima caused by double-slit interference (could be combined with diffraction).
40. Calculate the effects of interference from a thin film.