After completing Physics 102, you should be able to:

1. Understand some Properties of Solids and Fluids: (chapter 10)
   a. Operationally define Density and Pressure.
   b. Differentiate between gauge and absolute pressure.
   c. Explain the Buoyancy Force from fundamental concepts of pressure and forces.
   d. Work problems involving static fluids.
   e. Explain Bernoulli's equation in terms of energy.

2. Observe, Analyze and Report situations involving heat transfer: (chapter 11)
   a. Explain the 0^{th} and 1^{st} Laws of Thermodynamics in terms of Energy concepts from Physics 101.
   b. Distinguish between heat and temperature.
   c. Give examples of thermometric properties
   d. Operationally define temperature scale, thermal equilibrium, specific heat capacity, and latent heat.
   e. Solve problems involving two substances coming to thermal equilibrium with possible phase changes.

3. Work with Ideal Gasses: (chapter 12)
   a. Describe the characteristics of an Ideal Gas.
   b. Describe several assumptions and conclusions of the Kinetic Theory of Gasses.
   c. State the Ideal Gas Law and explain how it simplifies to other relationships such as Charles and Boyles Laws.
   d. Solve problems involving the Ideal Gas Law.

4. Analyze Situations Involving Static Electricity: (chapters 16-17)
   a. Describe how objects are charged, directly and by induction.
   b. State Coulomb's Law.
   c. Describe, analyze, and predict motion and forces for systems that include charged objects or a given electric field.
   d. Describe, operationally, the Electric Field. Distinguish it from an Electric Force
   e. Describe, operationally, the Electric Potential. Distinguish it from an Electric Potential Energy

f. Analyze the effect of a given electric field on charged particles from an electric field map or equipotential line diagram.

g. Describe a capacitor in terms of charge and its general use.

5. Analyze Situations DC resistor circuits: (chapter 18)
   a. Describe operationally the difference between insulators and conductors.
   b. Define and solve problems using Resistance, Voltage (EPD), Current, Power, and Resistivity.
   c. Apply Ohm's Law to simple DC circuits.
   d. Solve simple circuits (circuit analysis). This includes drawing equivalent circuits.
   e. Demonstrate the proper use of a multimeter to measure the resistance of, current through, and voltage across a circuit element.
   f. Wire a circuit from a schematic and vice versa.

6. Analyze Situations Involving Magnetic Fields: (chapter 18)
   a. Describe how to test for a magnetic field and draw magnetic field lines.
   b. Explain how to find magnetic flux (dot product) using vector component concepts. Contrast with situations involving cross products.
   c. Lenz's Law and Faraday's Law
   d. Ampere's Law
   e. Apply Right Hand Rules to problems involving moving charges or changing magnetic fields.
   f. Describe the physics of how such devices as Transformers, Motors and Generators function

Lab Outcome

7. Carry out a lab experiment from design to report phase.

   Purpose:

   a. Suggest a question that would lend itself to be answered through carrying out a laboratory experiment. Students should choose variables to be explored that can be measured or derived and consider situations that allow the control of other variables.

   b. When the experiment involves the discovery or comparison of a relationship, students should be able to write a purpose specifying the quantities involved, use the term "relationship" appropriately, and refer to the comparison when appropriate.

   Theory:

   a. Write statements that describe what led to the question asked in the purpose (discovery lab).

   b. Using reasoning from fundamental principles, give predictions (where possible) for values, graphs, equations, and patterns.

Procedure:

a. Write a procedure in step form.

b. Where appropriate include diagrams, initial conditions, and factors to ensure repeatability.

Data:

a. Observe and record both qualitative and quantitative data (including units).
b. Appropriately report data for quantities that have many values (such as table of position and time data) and quantities that are measured only once (such as initial values).
c. Report uncertainty for measured data in the form Value +/- Range. Give reasoning to support this uncertainty.

Analysis

a. Write statements that compare results to each item from the theory section.
b. Calculate derived data and derived uncertainty from measured data and uncertainty when necessary. Then report in the appropriate form for formal lab reports (tables and graphs).
c. Write the equation of a best-fit line (linearize if necessary) and explain the physical meaning of each term.
d. Predict a result based on lab analysis and test the prediction.

Conclusion

a. Write a conclusion statement based upon qualitative and quantitative observations that provide an answer to the question posed in the purpose.
b. Suggest alternate experimental questions that have resulted from the lab.