Physics 4700 Experiment 3
Diodes

1) Measure and graph the current through a diode vs the voltage applied across it for both forward and reserve biasing voltage. Use a DC power supply, zener diode, resistor(s) and multimeter. The forward current in the diode should not exceed 300 mA.

2) Build a clipping circuit that limits the voltage swing from -0.6 V to 5.6 V. Use a 1 kΩ input resistor. Derive the 5 V reference from a 5 V source (power supply). Apply a 1 kHz sine wave. Vary the amplitude of the input voltage and capture pictures of the input and output waveforms (2 waveforms/picture). Repeat for a triangular input waveform.

3) Build a full wave rectifier. Capture a picture of the input and output waveforms (2 waveforms/picture). Modify the circuit so that the output voltage approximates DC. Use your signal generator for the voltage source. Use a transformer to couple the input voltage to your circuit. Details on rectifier circuits can be found in almost every electronics book. Here are two sources: Simpson (P187 and P857, experiment 10) and Hayes and Horwitz Student Manual (P76).

Ripple factor may be defined as the ratio of the rms of the ripple voltage to the absolute value of the dc component of the output voltage. Ripple voltage is commonly expressed as the peak-to-peak value. How is the ripple factor of your circuit compared to that for an ideal circuit?

4) The following circuit is called a voltage doubler. Build it and find out why it has earned this name. Pick $RC >>$ the period of V_{in}. What is the relationship between V_p and V_{out}? Capture using a picture of the V_{in}, V_p, and V_{out} waveforms. How could you make a voltage quadrupler? See Diefenderfer P120 for details. Also Simpson P193 for a slightly different version of this circuit.