

# Basic Industrial Electricity

1. What is electricity?
  - a. Atomic Structure
  - b. Electrical Charge
  - c. Resistance and Conductance
    - i. What makes a material resist electrical flow?
    - ii. What makes a material a good conductor of electricity?
    - iii. Resistors connected in series and parallel
  - d. What is voltage?
    - i. DC Voltage Sources
      1. Batteries
      2. DC Power supplies
    - ii. AC Voltage sources
      1. Generator
      2. Function generator
  - e. What is current?
2. Simple DC electrical circuits
  - a. Ohms Law
  - b. Power sources, switches, grounds and loads
  - c. Power sources in series
  - d. Power sources in parallel
  - e. Series resistive circuits
    - i. Kirchhoff's voltage divider
  - f. Parallel resistive circuits
    - i. Kirchhoff's current divider
  - g. Electrical Power
    - i. Watts and Horsepower
3. Using Meters to measure electrical parameters
  - a. What is a VOM?
  - b. Safety concerns
    - i. Voltage rating
    - ii. Selecting the correct scale
    - iii. Connect the meter properly
    - iv. Loading effects
  - c. Measuring resistance and continuity
  - d. Measuring DC and AC voltage
  - e. Measuring small currents with a VOM
  - f. Measuring large currents with a clamp-on ammeter
4. DC Circuits Lab
  - a. Use a breadboard to construct various series and parallel electrical circuits. Calculate voltage levels and current flows. Measure the voltages and currents to verify the calculations.

## 5. AC Circuits

- a. Capacitance
  - i. What is a capacitor?
  - ii. Charging a capacitor
  - iii. Capacitors in series and in parallel
  - iv. Capacitors in DC circuits
- b. Inductance
  - i. What is an inductor?
  - ii. Magnetic fields and inductors
  - iii. Inductors in series and in parallel
  - iv. Inductors in DC circuits
- c. Single phase sinusoidal voltage source
  - i. How is AC voltage produced?
  - ii. Sinusoidal waveforms
    - 1. Instantaneous value, average value, peak value, RMS value
    - 2. Frequency and period
  - iii. Resistors in AC circuits
  - iv. Capacitors in AC circuits
  - v. Inductors in AC circuits
- d. Real power, reactive power and apparent power
  - i. Power factor
- e. Transformers
  - i. Magnetic coupling and induced voltage
  - ii. Construction
  - iii. Turns ratio
    - 1. Effects on voltage
    - 2. Effects on current
  - iv. Power flow
- f. Three phase systems
  - i. Three phase generation
  - ii. Y and Delta configurations
  - iii. Phase sequence
  - iv. Balanced loads
  - v. Unbalanced loads
- g. Final Exam

Course grading will be as follows:

1. 1/3 on attendance
2. 1/3 on DC lab
3. 1/3 on final exam
4. A pre-test will be given at the start of the course, which will be similar to the final exam to establish a baseline of knowledge.