

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. Kirchhoffs voltage divider
 - f. Parallel resistive circuits
 - i. Kirchhoffs 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.