1. **ECE 2110 - Machines and Electronic Circuits**

2. 3 credits – 5 contact hours (2 hours lecture – 3 hours lab per week)

3. Dr. Ralph Tanner, Professor, ECE


5. Specific course information
   a. Introduction to machines and electronics for non-electrical engineering students. Principles of operation, characteristics, ratings, and applications of transformers, alternators, motors, diodes, and transistors.
   b. Prerequisite: ECE 2100
   c. EE and CPE students may not use credit in ECE 2110 toward graduation

6. Specific goals for the course
   a. The purpose of this course is to introduce engineers from disciplines other than electrical or computer engineering to the overall field of electrical engineering. This course is designed to expose these engineers to impact that electrical engineering will have upon their practice of engineering.
   b. Since this is a service course, the ABET criteria is not specifically measured for participation in the course.

7. Brief list of topics to be covered
   a. Overview of Electrical Engineering
   b. Electrical Safety
   c. Steady-state AC Analysis
   d. Power Systems and Transmission Lines
   e. Frequency Analysis
   f. Electronic Circuits
   g. Electromechanics
   h. Electric Machines
1. **Course number and name**: ECE 2210: Electronics I

2. **Credits and contact hours**: 4 credits and 6 hours

3. **Course coordinator**: Steven Durbin, Professor

4. **Text book**:
   c. ECE 2210 Laboratory Manual, Dept of Electrical and Computer Engineering, Western Michigan University
   d. SPICE circuit simulation software, e.g. LTSpice® PSpice® circuit simulation
   e. package
   f. MATLAB® and Simulink® mathematics software suite

5. **Course Information**
   b. Prerequisites: ECE 2100 and PHYS 2070; with a grade of “C” or better in all prerequisites.
   c. Required

6. **Specific goals for the course**
   a. **Specific outcomes of instruction** -
      1. The student will learn usage of non-linear devices (diodes, BJTs, MOS and JFETs, simple ICs) in amplifier building switches, logic circuits, shaping of waveforms, indicator designs, and integrated circuits. (b,c,e,f,k)
      2. The student will learn to translate non-linear devices into equivalent circuits that are composed of linear elements (equivalent resistance, equivalent capacitance, equivalent inductance, current sources, and voltage sources). (a,b,e,k)
      3. The student will develop an ability to specify design criteria (gain, input resistance, output resistance). (a,b,c,e,f,g,k)
      4. The student will learn how to read, locate, and interpret data from specification sheets/manuals. (c,e,f,h,k)
      5. The student will develop an ability to select components, interpret terminal characteristics of the components, model components, design circuit, and understanding operation of circuit. (c,e,k)
6. The student will learn to draw circuit diagram of design. (a,b,c,e,f,g,k)
7. The student will learn how to use application software (PSPICE, MATLAB, MATHCAD) for simulating circuits with non-linear devices. (a,b,c,e,i,k)
8. The student will understand how to use of appropriate laboratory equipment (oscilloscopes, function generators, multimeters) to determine the output behavior expected from standard set of inputs (dc, sine wave, square wave, triangular). (a,e,f)
9. The student will learn how to test circuits and identify the likely failure modes and find ways to minimize the failures. (a,c,e,f)

b. **ABET student outcome**: This course contributes to the attainment of the following student learning outcomes a, b, c, e, f, g, h, i and k. ABET learning outcomes e, f and k are directly assessed in this course.

7. **Brief list of topics to be covered**
   - Basic semiconductor concepts, current flow in semiconductors, physical structure and operation of pn junction
   - Terminal characteristics of ideal and junction diodes, diode circuits, diode modeling of forward characteristics, Zener diode, diode application- rectifiers, clamping, clipping, voltage regulation, Schottky-Barrier diode, photodiodes, light emitting diode (LED)
   - Physical structure and operation of MOSFET, current-voltage characteristics of NMOS, PMOS, CMOS, MOS circuit DC analysis, small-signal operation and models, discrete MOSFET amplifier
   - Physical structure and operation of BJT, current-voltage characteristics of npn BJT and pnp BJT, BJT circuit DC analysis, small-signal operation and models, discrete BJT amplifier
   - p-n-p and n-p-n Structures, Modes, Characteristics and Analysis, Small-Signal Circuits, Saturation and Switching
   - Analog concept- Transistor Amplifier, single-stage and multi-stage amplifiers
   - Digital concept- digital inverter implemented by CMOS or BJT