College of San Mateo
Official Course Outline

1. **COURSE ID:** ELEC 111 **TITLE:** Introduction to Electronics Fundamentals
   Units: 3.0 units **Hours/Semester:** 32.0-36.0 Lecture hours; 48.0-54.0 Lab hours; and 64.0-72.0 Homework hours
   Method of Grading: Letter Grade Only
   Prerequisite: Completion of or concurrent enrollment in ELEC 231.
   Recommended Preparation:
   MATH 110

2. **COURSE DESIGNATION:**
   Degree Credit
   Transfer credit: CSU
   AA/AS Degree Requirements:
   CSM - GENERAL EDUCATION REQUIREMENTS: E5a. Natural Science

3. **COURSE DESCRIPTIONS:**
   Catalog Description:
   Introduction to DC and AC electricity; reading simple schematic diagrams and construction of elementary electrical/electronics circuits; making measurements with multimeters and oscilloscopes; using DC power supplies and AC power sources with series, parallel and series-parallel resistive circuits; exploration of induction and capacitance in DC and AC voltage circuits. Emphasizes laboratory experiments and techniques. A materials fee as shown in the Schedule of Classes is payable upon registration.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**
   Upon successful completion of this course, a student will meet the following outcomes:
   1. Define the following terms: electron theory; conductors and insulators; voltage, current, resistance, power; electrical energy consumption, kilowatt-hour meter; resistor color-code.
   2. Demonstrate proper use of a scientific calculator to determine the following: series and parallel circuit values; DC and AC voltages and currents; metric prefixes and conversion factors.
   3. Perform calculations involving Ohm's Law, Watt's Law, and series/parallel/series-parallel circuits.
   4. Demonstrate skill in the use of laboratory equipment: power supplies, analog and digital multimeters, function generators and oscilloscopes.
   5. Define and calculate the following AC values: AC power; peak-peak, peak, rms, effective, and average values; frequency, period, and wavelength.
   6. Define the following terms pertaining to magnetism and inductance: Inductance; Lenz's law; inductive reactance (XL); applications for inductors; transformers; step-up/step-down and impedance ratios; practical applications.
   7. Define the following terms related to capacitance: types, identification and applications; charge and discharge timing constant; unit of measurement; factors that determine the capacitance of a capacitor; capacitive reactance (Xc); RC circuit; and impedance (Z).
   8. Define power factor, apparent power, reactive power and true power. Demonstrate how to measure and calculate phase angle and phase difference in RCL circuits.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**
   Upon successful completion of this course, a student will be able to:
   1. Define the following terms: electron theory; conductors and insulators; voltage, current, resistance, power; electrical energy consumption, kilowatt-hour meter; resistor color-code.
   2. Demonstrate proper use of a scientific calculator to determine the following: series and parallel circuit values; DC and AC voltages and currents; metric prefixes and conversion factors.
   3. Perform calculations involving Ohm's Law, Watt's Law, and series/parallel/series-parallel circuits.
   4. Demonstrate skill in the use of laboratory equipment: power supplies, analog and digital multimeters, function generators and oscilloscopes.
   5. Define and calculate the following AC values: AC power; peak-peak, peak, rms, effective, and average values; frequency, period, and wavelength.
   6. Define the following terms pertaining to magnetism and inductance: Inductance; Lenz's law; inductive reactance (XL); applications for inductors; transformers; step-up/step-down and impedance ratios; practical applications.

7. Define the following terms related to capacitance: types, identification and applications; charge and discharge timing constant; unit of measurement; factors that determine the capacitance of a capacitor; capacitive reactance (Xc); RC circuit; and impedance (Z).

6. **COURSE CONTENT:**

Lecture Content:

1. Definition of terms: electron theory; conductors and insulators; voltage, current, resistance, power; electrical energy consumption, kilowatt-hour meter; resistor color-code.
2. Proper use of a scientific calculator to determine the following: series and parallel circuit values; DC and AC voltages and currents; metric prefixes and conversion factors.
3. Perform calculations involving Ohm's Law, Watt's Law, and series/parallel/series-parallel circuits.
4. Demonstrate skill in the use of laboratory equipment: power supplies, analog and digital multimeters, function generators and oscilloscopes.
5. Define and calculate the following AC values: AC power; peak-peak, peak, rms, effective, and average values; frequency, period, and wavelength.
6. Define the following terms pertaining to magnetism and inductance: Inductance; Lenz's law; inductance reactance (XL); applications for inductors; transformers; step-up/step-down and impedance ratios; practical applications.
7. Define the following terms related to capacitance: types, identification and applications; unit of measurement; factors that determine the capacitance of a capacitor; capacitance reactance (Xc); RC circuit; and impedance (Z).

Lab Content:

1). Explore measurement of voltages in a circuit. Learn to use analog and digital meters to measure voltage drops and confirm Kirchhoff's voltage law for series resistive circuits.
2). Learn to use analog and digital meters to measure resistance of individual resistors and in a circuit. Explore how resistance affects voltage and current in a series circuit.
3). Examine Kirchhoff's current law in a series circuit. Learn to use analog and digital meters to measure current flow.
4). Examine and explore types of switches and how they work in a circuit.
5). Build and observe how a series parallel circuit works. Examine how to measure and record currents, resistance and voltages in circuit.
6). Explore how residential wiring is done to NEC code and build five circuits with UL approved components.
7). Explore and observe how induction works in a direct current circuit. Examine inductors (coils) in series and parallel using a RCL meter.
8).Explore and observe how Capacitance works in a direct current circuit. Examine Capacitors in series and parallel using a RCL meter. Observe how time constants work and the charge and discharge function of a capacitor.
9). Learn how to use an Oscilloscope to measure voltages in Peak and Peak to Peak. Demonstrate how to measure frequencies and AC/DC wave forms.
10). Explore measuring voltages and frequencies in AC/DC circuits using an oscilloscope.
11). Demonstrate understanding of Series, Parallel and Series-Parallel resistive circuits.

7. **REPRESENTATIVE METHODS OF INSTRUCTION:**

Typical methods of instruction may include:

A. Other (Specify): a. Lectures b. Handouts c. Homework assignments from the textbook d. Videos e. Computer based training activities f. Lab activities

8. **REPRESENTATIVE ASSIGNMENTS**

Representative assignments in this course may include, but are not limited to the following:

Writing Assignments:

Lab conclusions and weekly lab handouts.

Reading Assignments:

Weekly reading assignments from text and instructor handouts.

9. **REPRESENTATIVE METHODS OF EVALUATION**

Representative methods of evaluation may include:

A. a. Quizzes b. Examinations c. Homework assignments d. CBT results e. Lab activities

10. **REPRESENTATIVE TEXT(S):**

Possible textbooks include:

A. Petruzella. *Essentials of Electronics.*, 2nd ed. -, 2001

Other:

A. CSM. ELEC 111 Electronics Fundamentals: Laboratory Manual and Supplemental Handouts.

Origination Date: November 2021
Curriculum Committee Approval Date: December 2021
Effective Term: Fall 2022
Course Originator: Steven Gonzales