Modesto Junior College
Course Outline of Record
ELTEC 208

I. OVERVIEW
The following information will appear in the 2010 - 2011 catalog

ELTEC 208 The World of Electricity and Electronics 3 Units
Also offered as: INTEC - 208: The World of Electricity & Electronics
Recommended for Success: Before enrolling in this course, students are strongly advised to satisfactorily complete MATH 20 with a minimum grade of C or better.

An overview of electrical and electronic phenomena as applied to common consumer and industrial devices. The course examines the physical nature and laws of electricity and magnetism and the application of the scientific method. DC and AC circuits and their characteristics are examined, predicted, and measured. Electronic test equipment and voltage sources are utilized in the construction, troubleshooting and testing of electrical and electronic circuits. The historical development and the socioeconomic aspects of the "electronic age" are also examined. **This course is approved by the State of California for the Department of Apprenticeship Standards (DAS) Electricians Training Program.

Materials Fee Required

Field trips are not required. (A-F or P/NP - Student choice) Lecture /Lab
Transfer: (CSU) General Education: (MJC-GE: A )

II. LEARNING CONTEXT
Given the following learning context, the student who satisfactorily completes this course should be able to achieve the goals specified in Section III, Desired Learning:

A. COURSE CONTENT

1. Required Content:

   A. The structure of matter
   B. The nature of electricity; electrostatics
   C. Numbers, conversions and units of measure
   D. Energy and power
   E. Voltage, current, and resistance
   F. Physical laws in electrical circuits
   G. Application of the scientific method
   H. Electrical measurements
   I. Circuits: series, parallel, and series-parallel
   J. Inductors and capacitors
   K. Magnetism, magnetic circuits and devices
   L. Alternating currents and waveforms
   M. Transformers
   N. Semiconductor materials
   O. Diodes
   P. Transistors
   Q. Integrated circuits

2. Required Lab Content:

   1. Circuit construction from a schematic diagram.
   2. Circuits: series, parallel, and series-parallel
   3. Voltage, current, and resistance, and power.
5. Physical laws in electrical circuits
6. Alternating currents and waveforms.
7. Oscilloscope measurements.
9. Inductance and capacitance.
10. Transformers.
11. Diodes.
12. Transistors.
13. Integrated circuits.

B. ENROLLMENT RESTRICTIONS

1. Advisories

Before enrolling in this course, students are strongly advised to satisfactorily complete MATH 20 with a minimum grade of C or better.

C. HOURS AND UNITS

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D. METHODS OF INSTRUCTION (TYPICAL)

Instructors of the course might conduct the course using the following method:

1. Lecture
2. Lab Demonstration
3. Guest Speakers
4. Multi-media (DVD, Videos, Power Point, simulations, etc)
5. Lab Exercises

E. ASSIGNMENTS (TYPICAL)

1. EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS

Time spent on coursework in addition to hours of instruction (lecture hours)

Weekly Assignments to include the following:

- Textbook reading consisting of typically one chapter plus handouts as assigned.
- Design projects that are completed outside of class to be built and tested in a lab.
- Homework questions on the assigned reading.
- Preparation for laboratory activities related to the current topic.
- Other assignments including problem sets, computer based instruction, computer based simulated labs, and computer and/or online videos.

2. EVIDENCE OF CRITICAL THINKING
Assignments require the appropriate level of critical thinking

Examples of assignments that assist students in developing critical thinking include:

- Based upon the provided schematic diagram and/or other instructions, construct a properly functioning circuit.
- Based upon the provided schematic diagram, classify an electrical circuit as series, parallel, or series-parallel.
- Given a functional circuit and a multimeter, correctly measure the resistance of, voltage across, or current flowing through designated components.
- Given a source of unknown sinusoidal alternating current and oscilloscope, correctly measure the peak-to-peak amplitude and then convert this to peak, average, root-mean-squared (RMS) values.
- Given a source of unknown alternating current and an oscilloscope, correctly measure the period and convert it to a frequency.
- Based upon the provided schematic diagram, identify common schematic diagram symbols.

**F. TEXTS AND OTHER READINGS (TYPICAL)**


5. **Manual:** James S. Howen. *Basic Electricity Lab Manual* (1e). Modesto, California

**III. DESIRED LEARNING**

**A. COURSE GOAL**

As a result of satisfactory completion of this course, the student should be prepared to:

describe common electrical and electronic phenomena as applied to consumer and industrial devices. Correctly use a multimeter and oscilloscope to perform electrical measurements. Apply formulas and laws to predict the behavior of basic electrical circuits. Finally, identify and avoid safety hazards where electricity is present.

**B. STUDENT LEARNING GOALS**

Mastery of the following learning goals will enable the student to achieve the overall course goal.

1. **Required Learning Goals**

   Upon satisfactory completion of this course, the student will be able to:

   a. Describe the basic principles of electrostatics, the nature of electricity, and the basic structure of matter.

   b. Identify and describe resistive properties of materials to the operation of common electrical and electronic devices.

   c. Use common electrical and electronic instruments: digital multimeter, voltage sources, signal generator and oscilloscope.
d. Identify the concepts of energy and power and their application to electrical and electronic devices.

e. Use Ohm's law, Kirchoff's law, voltage divider theorem, and the Power law to calculate and predict operating characteristics of components in electrical circuits.

f. Describe and measure AC voltage parameters such as peak, peak-to-peak, RMS, and average values.

g. Calculate and measure electrical circuit properties such as voltage, current, resistance, power dissipation, capacitance, and inductance in AC and DC circuits.

h. Describe the concept of impedance and the influence of resistance and reactance on the operation of AC circuits.

i. Differentiate between power, apparent power, and reactive power in AC circuits and be able to compute the power factor.

j. Identify and describe the general purposes of transformers, and measure their characteristics.

k. Identify and describe the various generator and motor types and the principles upon which they are based.

l. Identify and measure the electrical properties and operating characteristics of diodes and transistors.

m. Identify common integrated circuit components.

n. Identify the controls of an oscilloscope and describe their proper use.

2. **Lab Learning Goals**

   *Upon satisfactory completion of the lab portion of this course, the student will be able to:*

   a. Construct a series, parallel, or series-parallel circuit from a schematic diagram.

   b. Use common electronic instruments such as a digital multimeter, voltage sources, signal generator, and oscilloscope to verify proper circuit operation and to measure circuit characteristics such as voltage, current, resistance, period, capacitance, inductance and frequency.

   c. Analyze a series, parallel, or series-parallel circuit using Ohm's law and power formulas to find unknown voltages, currents, resistances, and power dissipation.

   d. Troubleshoot a series, parallel or series-parallel circuit with short or open faults.

IV. **METHODS OF ASSESSMENT (TYPICAL)**

   **A. FORMATIVE ASSESSMENT**

   1. Classroom Topic Discussions

   2. Homework

   3. Lab Assignments

   4. Quizzes

   **B. SUMMATIVE ASSESSMENT**
1. Complex Lab Project/Assignments
2. Mid Term and Final Exams