Modesto Junior College  
Course Outline of Record  
ELTEC 212  

I. OVERVIEW  
The following information will appear in the 2009 - 2010 catalog  

ELTEC 212 Digital Principles and Circuits 3.33 Units  
Also offered as: CMPET - 212: Digital Principles and Circuits  
Materials Fee Required  

Introduction to digital circuits. Use and application of digital components in electronic devices controls and computers. Study of number systems, basic logic gates, counters, shift registers, A/D and D/A interfaces, and memories. Special emphasis on interfacing digital circuits to real-world input and output devices. Introduction to programmable logic devices. Prepares students for microprocessors and PLCs. This course is approved by the State of California for the DAS Electricians Apprenticeship program. Field trips are not required. Course is applicable to the associate degree.

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:  

   The content listed below is presented in a fashion that provides the student with a basic understanding of digital circuits. Analytical and laboratory skills will be developed using individual digital components and multi-digital IC circuits. Emphasis will be placed on how the topics relate to common consumer and industrial devices. An equal amount of class time is devoted to each topic listed below.

   A. Number Systems: Binary, BCD, and Hexadecimal  
   B. Basic logic gates  
   C. Combinational logic circuits  
   D. Boolean algebra and Karnagugh maps  
   E. Input devices and encoders  
   F. Input devices and decoders  
   G. RS, JK, and D flip-flops  
   H. Multiplexers and decoders  
   I. Counters  
   J. Shift registers  
   K. Memories  
   L. A/D and D/A converters

2. Required Lab Content:  

   a. Digital Signals, Breadboards, Color Codes  
      Number Systems  
      Logic Gates: AND/OR  
      Logic Gates: Inverter, Nand/Nor  
      Logic Gates: XOR/XNOR, NAND as a Universal gate  
      Convert Gates with Inverters  
      Design Logic Circuits  
      Karnough maps  
      Simulations, Data Selectors  
      Interfacing TTL/CMOS, Motors/Relays  
      Optoisolators, Special Coding  
      7-Segment LED/LCD  
      VF Displays, Midterm review  
      R-S & D Flip-Flops
J-K Flip-Flops, 4-Bit Latch, Schmitt Trigger
Ripple, Mod-10, Down Counters
Synchronous Counters
Cascading Counters
Freq. Division
Real-world Counters
Serial/Parallel Load Shift Registers
Universal Shift Registers
Memories
D/A Converter
Digital Troubleshooting

B. ENROLLMENT RESTRICTIONS

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. Laboratory demonstrations
3. Course topic discussions
4. Presentations via media (DVD, Videos, etc)

E. ASSIGNMENTS (TYPICAL)

1. EVIDENCE OF APPROPRIATE WORKLOAD FOR COURSE UNITS

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

   Daily reading assignments from the text and handouts.

   Weekly homework problems and research from the text and handouts.

   Design projects that are completed outside of class to be built and tested in lab.

2. EVIDENCE OF CRITICAL THINKING

   Assignments require the appropriate level of critical thinking

   Assignments:
   1. Determine a counter circuit that starts at "53" and counts down to "21", then stops.
   2. What is the fanout of a standard TTL gate driving 4000 series CMOS gates?

   Exam Questions:
   1. Using the following circuit, connect it to make a mod-10 ripple up-counter:
   2. Which type of memory would be best for storing an operating system in a high-volume application where the user must not be allowed to change anything?
F. TEXTS AND OTHER READINGS (TYPICAL)


III. DESIRED LEARNING

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

Design, construct, troubleshoot, and evaluate digital circuits and basic components. They should also be able to properly interface digital circuits to electromechanical and optical devices.

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. Manipulate and convert numbers in binary, BCD, and hexadecimal.
   b. Correctly identify the eight basic gates used in combinational logic circuits.
   c. Interface the two most common families of digital IC’s and describe their basic advantages and disadvantages.
   d. Properly construct output display circuits for TTL and CMOS IC’s using appropriate encoders.
   e. Construct and analyze the operation of simple A/D and D/A converters.

2. Lab Learning Goals
Upon satisfactory completion of the lab portion of this course, the student will be able to:

   a. Properly construct a digital circuit from a written schematic.
   b. Successfully troubleshoot digital circuits with faults.
   c. Design simple digital circuits from written descriptions, truth tables, or Boolean logic expressions.

IV. METHODS OF ASSESSMENT (TYPICAL)

A. FORMATIVE ASSESSMENT

1. Quizzes
2. Student participation in course topic discussions
3. Homework
4. Weekly Lab Exercises
B. **SUMMATIVE ASSESSMENT**

1. Mid Term
2. Final
3. Comprehensive lab projects