

College of San Mateo

Course Outline

- New Course
 Update/No change
 Course Revision (Minor)
 Course Revision (Major)

Date: Nov. 16, 2006
Removed HBA Fall 2010

Department: ELEC Number: 262

Course Title: Digital Electronics Units: 4.0

Hours/Week: Lecture: 3 Lab: 4 By Arrangement: 0

Length of Course

- Semester-long
 Short course (Number of weeks ___)
 Open entry/Open exit

Grading

- Letter
 Credit/No Credit
 Grade Option (letter or Credit/No Credit)

1. **Prerequisite** (Attach Enrollment Limitation Validation Form.)

Completion of ELEC 220 or the equivalent with a final grade of C or higher

2. **Corequisite** (Attach Enrollment Limitation Validation Form.)

None

3. **Recommended Preparation** (Attach Enrollment Validation Form.)

None

4. **Catalog Description** (Include prerequisites/corequisites/recommended preparation.)

A basic digital electronics course covering the analysis and troubleshooting of combinational and sequential logic circuits. Basic gates, symbols, equations, truth tables, gate applications, number systems, mux and demux, encoders, decoders, adders, flip-flops, counters, and shift registers are included in the class. (CSU)

5. **Class Schedule Description** (Include prerequisites/corequisites/recommended preparation.)

A basic digital electronics course covering the analysis and troubleshooting of combinational and sequential logic circuits.

6. **Student Learning Outcomes** (Identify 1-6 expected learner outcomes using active verbs.)

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

- recognize the symbol, equation, and truth table for all basic logic gates;
- analyze a combinational logic circuit from schematic to truth table and/or equation;
- use Boolean algebra to simplify a logic circuit;
- use Karnaugh mapping to simplify a logic circuit;
- describe the difference between active high and active low logic;

- f. analyze the operation of multiplex, demultiplex, adder, decoder, and encoder circuits;
- g. recognize the symbol and truth table for all basic flip-flops;
- h. design a synchronous or asynchronous counter circuit;
- i. describe the use of basic logic test equipment such as the logic probe, the digital multimeter, and the oscilloscope;
- j. describe the difference between SISO, PISO, and PIPO registers;
- k. function in the binary and hexadecimal number system;
- l. construct logic circuits using PAL technology

7. **Course Objectives** (Identify specific teaching objectives detailing course content and activities. *For some courses, the course objectives will be the same as the student learning outcomes. If this is the case, please simply indicate this in this section).*

Same as above

8. **Course Content** (Brief but complete topical outline of the course that includes major subject areas [1-2 pages]. Should reflect all course objectives listed above. In addition, you may attach a sample course syllabus with a timeline.)

I Introduction to Digital Electronics

- A Analog vs. digital signals
- B Series vs. parallel data
- C Basic digital logic circuits
- D The integrated circuits
- E The nature of digital signals

II Numbers and Codes

- A Binary number system and conversions
- B Hexadecimal number system and conversions
- C Octal number system and conversions
- D Binary-Coded Decimal
- E ASCII
- F Gray Code
- G 1s and 2s Complements
- H Baudot
- I IBM specific codes

III Logic Gates

- A Active high vs. active low
- B AND and OR gates
- C Inverter
- D NAND and NOR gates
- E XOR and XNOR gates
- F Duality

IV Combinational Logic Circuits

- A Analysis of a complex logic diagram
- B Truth tables, equations, and logic diagrams

V Troubleshooting techniques

- A Boolean algebra theorems and laws
- B DeMorgan's theorems
- C Circuits simplifications with Boolean algebra

- D The universal properties of the NAND and NOR gate Karnaugh Maps for circuit simplification
- VI Electrical Characteristics of logic gates
 - A TTL data sheet interpretation
 - B Recommended vs. Max. VS. Min. ratings
 - C Electrical characteristics
 - D Switching characteristics
 - E Noise immunity
 - F Power Dissipation
 - G AC and DC fan out
 - H Speed vs Power
 - I Floating pins
 - J Icc Switching Noise
 - K Open collector Hardware
 - L Tri-state hardware
 - M Common failure modes
 - N CMOS performance
- VII MSI Logic Devices
 - A Decoders
 - B Encoders
 - C Display Drivers
 - D Multiplexers and Demultiplexers
 - E Adders, Subtractors, Parity, and Comparators
- VIII Flip-flips and Latches
 - A NAND and NOR gate latch
 - B RST latch
 - C D-type latch
 - D Edge triggering
 - E JK circuits
 - F Waveform analysis and predictions
- IX Clock circuits
 - A One-shot trigger circuit
 - B Free running clock circuit
 - C Schmitt inputs
- X Counters
 - A Asynchronous Counters and Dividers
 - B Synchronous Counters and Dividers
 - C Up/Down counters
 - D Counters that start above zero and stop before maximum count
 - E Counter applications
 - F Counter troubleshooting
- XI Shift Registers
 - A Basic data register (PIPO)
 - B Data converters (PIPO and PISO)
 - C Shift counters (SISO) including Johnson and Ring
- XII Programmable Logic Devices
 - A ROM logic functions
 - B Programmable array logic devices

- C Using CUPL to program a PAL
- D Logic circuit synthesis in a PAL

9. **Representative Instructional Methods** (Describe instructor-initiated teaching strategies that will assist students in meeting course objectives. Include examples of out-of-class assignments, required reading and writing assignments, and methods for teaching critical thinking skills.)
- a. Lectures
 - b. Handouts
 - c. Homework assignments from the textbook
 - d. Videos
 - e. Computer based training activities
 - f. Lab activities
10. **Representative Methods of Evaluation** (Describe measurement of student progress toward course objectives. Courses with required writing component and/or problem-solving emphasis must reflect critical thinking component. If skills class, then applied skills.)
- a. Quizzes
 - b. Examinations
 - c. Homework assignments
 - d. CBT results
 - e. Lab activities
 - f. Class handouts
11. **Representative Text Materials** (With few exceptions, texts need to be current. Include publication dates.)

Digital Electronics. By Bignell and Donovan. 5th Edition. Del Mar, copyright 2006.
CSM ELEC 262 Lab Manual.

Prepared by: _____
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