San Bernardino Valley College
Curriculum Approved: SPRING 2000
Last updated: April 10, 2002

I. CATALOG DESCRIPTION:

A. Department Information:

Division:	Science and Math
Department:	Computer Science
Course ID:	CS 130
Course Title:	Applied Computer Logic
Units:	3
Lecture:	3 Hours
Laboratory:	None
Prerequisite:	CS 110

B. Catalog and Schedule Description:
An introduction to digital systems. Topics include Boolean algebra, truth tables, logic gates, number systems and codes. Karnaugh maps, flip-flops, counters and registers, digital arithmetic, combinational logic and functions.

II. NUMBER OF TIMES COURSE MAY BE TAKEN FOR CREDIT: One

III. EXPECTED OUTCOMES FOR STUDENTS:

Upon completion of the course the student should be able to:

A. Understand and use numerical representations in digital systems
   1. Binary numbers
   2. Octal numbers
   3. Hexadecimal numbers
   4. Parallel versus serial representation
B. Recognize and convert binary codes using
   1. Weighted and Nonweighted binary codes
   2. Error-detecting and error-correcting codes
   3. Truth tables
   4. DeMorgan's theorems
C. Construct simple logic gates
   1. AND/OR/NOT gates
   2. NOR/NAND gates
   3. Exclusive-OR and exclusive-NOR gates
   4. Converting gates and using inverters
   5. Combining logic gates
D. Design simple combinational logic circuits using
   1. The Karnaugh map method
   2. Sum of product forms
   3. Product of sum forms
   4. Logic circuits with multiple outputs
E. Design simple flip-flops
F. Understand digital arithmetic: operations and circuits
G. Compare and distinguish counters and registers
H. Compare and distinguish different types of memory devices
I. Recognize the different components of the microprocessor

IV. COURSE CONTENT:

A. Numerical representations in digital systems
   1. Binary numbers
   2. Octal numbers
   3. Hexadecimal numbers
   4. Parallel versus serial representation
B. Boolean algebra and binary codes
   1. Weighted and Nonweighted binary codes

2. Error-detecting and error-correcting codes
3. Truth tables
4. DeMorgan's theorems

C. Logic gates
1. AND/OR/NOT gates
2. NOR/NAND gates
3. Exclusive-OR and exclusive –NOR gates
4. Converting gates using inverters
5. Combining logic gates

D. Combinational logic circuits
1. The Karnaugh map method
2. Sum of product forms
3. Product of sum forms
4. Logic circuits with multiple outputs

E. Flip-flops
1. Clocked flip-flops
2. Triggering of flip-flops
3. Timing considerations

F. Digital arithmetic: operations and circuits
1. Signed numbers
2. Binary arithmetic and hexadecimal arithmetic
3. 1's complement and 2's complement
4. Design a full adder
5. Parallel and serial addition

G. Counters and registers
1. Ripple (asynchronous) counters
2. Parallel (synchronous) counters
3. Up/down counters
4. Shift registers
5. Serial-load and parallel-load shift registers

H. Memory devices
1. General memory operation
2. Semiconductor memory technologies
3. ROM and RAM architecture

I. Introduction to the microprocessor
1. Binary data words
2. Instruction words
3. Machine language
4. Input and output operations
5. Timing and control
6. Arithmetic-logic-unit

V. METHODS OF INSTRUCTION:

A. Lecture
B. Discussion
C. Multi-media
D. Projects

VI. TYPICAL ASSIGNMENTS:

A. Read assigned textbook(s) and manual(s)
B. Analyze problems in binary logic
C. Design simple circuits
1. Sample lab projects
2. Design a 6-input AND gate. Label input as A, B, C, D, E, and F. Label output as Y
3. Design the logic circuit for the Boolean expression: A*B*C+B*C=Y

4. Draw a 4-variable product-of-sums type Karnaugh map

D. Build simple circuits
   1. Sample lab projects
   2. Build simple 2-input adder on the circuit board
   3. Build and inverter using one input

E. Discuss special digital problems in class

VII. EVALUATION(S):

A. Binary logic projects
   1. One project per week

B. Examinations and quizzes
   1. Two exams: midterm and final
   2. Weekly quizzes on reading assignments
      a) Sample test questions
         i) Write the Boolean expression for a 4-input OR gate
         ii) Draw the logic symbol for a 4-input AND gate
         iii) What would a decoder do in a calculator?
         iv) What is the maximum binary count for a 5-bit counter?
         v) How many clock pulses would it take to load a 5-bit- serial-load shift register?

VIII. TYPICAL TEXT(S):

Tocci, R. Digital Systems. Prentice Hall, 1996
Tokheim, R. Digital Principles. McGraw Hill, 1990

IX. OTHER SUPPLIES REQUIRED OF STUDENTS: None