Wayne County Community College District

COURSE SYLLABUS

CT 203 Digital Logic I

CREDIT HOURS: 4.00

CONTACT HOURS: 75.00

COURSE DESCRIPTION:
This course covers Boolean algebra, operation of digital combinational gates, flip-flop circuitry, shift registers and clock circuits and design combinational and sequential circuits. Laboratory is an essential phase of this course, which emphasizes the use of logic probes, logic pulsars and logic clips on gating circuits, flip-flops, counters, shift registers and multiplexers and demultiplexers.

PREREQUISITES:
None

EXPECTED COMPETENCIES:
Upon completion of this course, the student will be familiar with:

1. Distinguish between analog and digital representations.
2. Cite the advantages and drawbacks of digital techniques compared with analog.
3. Understand the need for analog-to-digital converters (ADCs) and digital to analog converters (DACs).
4. Recognize the basic characteristics of the binary number system.
5. Convert a binary number to its decimal equivalent
6. Count in the binary number system.
7. Identify typical digital signals
8. Identify a timing diagram.
9. State the differences between parallel and serial transmission.
10. Describe the property of memory.
11. Describe the major parts of a digital computer and understand their functions.
12. Distinguish among microcomputers, microprocessors, and micro controllers.
13. Convert a number from one number system (decimal, binary, octal, hexadecimal) to its equivalent in one of the other number systems.
14. Cite the advantages of the octal and hexadecimal number systems.
15. Count in octal and hexadecimal
16. Represent decimal numbers using the BCD and straight binary.
17. Understand the purpose of alphanumeric codes such as the ASCII code.
18. Explain the parity method for error detection
19. Determine the parity bit to be attached to a digital data string.
20. Convert a logic expression into a sum-of-products expression to its simplest form.
21. Use Boolean algebra and the Karnaugh map as tools to simplify and design logic circuits.
22. Explain the operation of both exclusive-OR and exclusive- NOR circuits.

23. Design simple logic Circuits without the help of a truth table.
24. Implement enable circuits.
25. Cite the basic characteristics of TTL and CMOS digital IC s.
26. Use the basic troubleshooting rules of digital systems.
27. Deduce from observed results the faults of malfunctioning combinational logic circuits
28. Describe the fundamental idea of programmable logic devices (PLDs)
29. Outline the steps involved in programming a PLD to perform a simple combinational logic function.
30. Go to the CUPL User's Manual to acquire the information needed to do a simple programming experiment in the lab.
31. Construct and analyze the operation of a latch flip-flop made from NAND or NOR gates.
32. Describe the difference between synchronous and asynchronous systems.
33. Understand the operation of edge-triggered flip-flops.
34. Analyze and apply the various flip-flop timing parameters specified by the manufacturers
35. Understand the major differences between parallel and serial data transfers
36. Draw the output timing waveforms of several types of flip-flops in response to a set of input signals.
37. Recognize the various IEEE/ANSI flip-flop symbols.
38. Use state transition diagrams to describe counter operation.
39. Use flip-flops in synchronization circuits.
40. Connect shift registers as data transfer circuits.
41. Employ flip-flops as frequency-division and counting circuits.
42. Understand the typical characteristics of Schmitt triggers.
43. Apply two different types of one-shots in circuit design.
44. Design a free-running oscillator using a 555 timer.
45. Recognize and predict the effects of clock skew on synchronous circuits.
46. Troubleshoot various types of flip-flop circuits.
47. Program a PLD using CUPL's state transition format for circuit description
48. Perform binary addition, subtraction, multiplication, and division on two binary numbers.
49. Add and subtract hexadecimal numbers.
50. Know the difference between binary addition and OR addition.
51. Compare the advantages and disadvantages among three different systems of representing signed binary numbers.
52. Manipulate signed binary numbers using the 2's-complement system.
53. Understand the BCD adder circuit and the BCD addition process.
54. Describe the basic operation of an arithmetic/logic unit.
55. Employ full adders in the design of parallel binary adders.
56. Cite the advantages of parallel adders with the look-ahead carry feature.
57. Explain the operation of a parallel adder/subtractor circuit.
58. Use an ALU integrated circuit to perform various logic and arithmetic operations on input data.
59. Read and understand the IEE/ANSI symbol for a parallel adder.
60. Analyze troubleshooting case studies of adder/subtractor circuits
61. Program a PLD to operate as a 4-bit full adder.
62. Understand the operation and characteristics of synchronous and asynchronous counters.
63. Construct counters with MOD numbers less than 2⍰.
64. Identify IEEE/ANSI symbols used in IC counter and registers.
65. construct both up and down counters.
66. Connect multistage counters.
67. Analyze and evaluate various types of preset table counters.
68. Design arbitrary-sequence synchronous counters.
69. Understand several types of schemes used to decode different types of counters.

70. Anticipate and eliminate the effects of decoding glitches.
71. Compare the major differences between ring and Johnson counters.
72. Analyze the operation of a frequency counter and of a digital clock.
73. Recognize and understand the operation of various types of IC registers.
74. Apply existing troubleshooting techniques used for combinational logic systems to troubleshoot sequential logic systems.
75. Program a GAL 16V8 to operate as a counter.
76. Read and understand digital IC terminology as specified in manufacturer's data sheets.
77. Compare the characteristics of standard TTL and the various TTL series.
78. Determine the fan-out for a particular logic device.
79. Use logic devices with open-collector outputs.
80. Analyze circuits containing tristate devices.
81. Compare the characteristics of the various CMOS series.
82. Analyze circuits that use a CMOS bilateral switch to allow a digital system to control analog signals.
83. Describe the major characteristics of and differences among TTL, ECL, MOS, and CMOS logic families.
84. Cite and implement the various considerations that are required when interfacing digital circuits from different logic families
85. Use voltage comparators to allow a digital system to be controlled by analog signals.
86. Use a logic pulser and a current tracer as digital circuit troubleshooting tools.
87.

ASSESSMENT METHODS:

Student performance may be assessed by examination, quizzes, case studies, oral conversation, group discussion, oral presentations. The instructor reserves the option to employ one or more of these assessment methods during the course.

GRADING SCALE:

90%-100% = A
80%-89.9%= B
70%-79.9%= C
60%-69.9%= D
<60% = E