

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE  
MASTER SYLLABUS

**DIGITAL FUNDAMENTALS W/ LAB  
EET 1310**

**Class Hours: 3.0**

**Credit Hours: 4.0**

**Laboratory Hours: 3.0**

**Date Revised: Fall  
2001**

NOTE: This course is not intended for transfer credit.

**Catalog Course Description:**

A study of basic numbering systems, basic computer codes, and Boolean Algebra, basic logic gates, logic simplification using Boolean Algebra and Karnaugh maps. Topics include flip-flops, counters, shift registers, different types of memory (RAM, ROM, EPROM), and basic microprocessor principles.

**Entry Level Standards:**

The student must have an understanding of DC circuit principles.

**Prerequisites:**

None

**Textbook(s) and Other Reference Materials Basic to the Course:**

Floyd. *Digital Fundamentals*. 7th ed. Prentice-Hall.

Parts Kit: Approximate cost: \$20.00

Reference:

Bartee. *Digital Computer Fundamentals*. McGraw-Hill.

Tocci. *Digital Systems*. Prentice-Hall.

Deem, Murdrow, Zeppa, Reston. *Digital Computer Circuits and Concepts*.

**I. Week/Unit/Topic Basis:**

<b>Week</b>	<b>Topic</b>
1	Basic Principles of Digital Systems
2	Number Systems and Codes
3	Logic Gate Networks and Boolean Algebra
4	Combinational Logic
5	Combinational Logic
6	Functions of Combinational Logic
7	Functions of Combinational Logic

8	Introduction to Programmable Logic Devices
9	Flip-Flops and Related Devices
10	Flip-Flops and Related Devices
11	Counters
12	Shift Registers
13	Sequential Logic Application of PLDs
14	Memory, Interfacing, and Microprocessor Addressing
15	Review
16	Final Exam

## II. Course Objectives\*:

- A. Understand number systems (Binary, Octal, Hexadecimal). I, II, III, VII
- B. Understand binary codes. II, V, VI
- C. Understand the operation of basic logic gates (AND, OR, NOT, NAND, NOR). II, III, IV
- D. Understand the Boolean expression of logic functions and be able to simplify these expressions. II, III, IV
- E. Understand the operation of adders and comparators. III, IV, V
- F. Understand the operation of decoders, encoders, multiplexers, and demultiplexers. III, IV, V
- G. Understand basic flip-flop operations (D, RS, RST, and SK flip-flops). V, VI
- H. Understand basic counter circuits, V, VI
- I. Understand basic shift register circuits. IV, V, VI
- J. Understand the advantages and disadvantages of different logic families. IV, V, VI
- K. Understand and use programmable logic devices. IV, V, VI
- L. Understand and use 555 timers. IV, V, VI

\*Roman numerals after course objectives reference goals of the EET program.

## III. Instructional Processes\*:

Students will:

1. Participate in classroom discussions which challenge their abilities to think creatively and visualize complex spatial and mathematical relationships to solve problems. *Problem Solving and Decision Making Outcome*
2. Work in teams to conduct laboratory experiments and also to solve special problem

assignments. These activities are designed to foster interpersonal skills in teamwork and develop and enhance leadership skills, students' abilities to express ideas, and students' abilities to reach consensus solutions for the team through negotiation. *Active Learning Strategy, Problem Solving and Decision Making Outcome, Personal Development Outcome*

3. Use electronic test equipment to test electrical circuits constructed from schematics in the laboratory and acquire data. Use computers with applications software to simulate, analyze, and predict the behavior of electrical circuits. Compare expected responses to experimental responses of electrical circuits. Use the Internet for special assignments such as locating data sheets on electronic components. Use computers with word processing software to prepare reports. *Technological Literacy Outcome, Information Literacy Outcome, Numerical Literacy Outcome*
4. Prepare reports on laboratory experiments which include methodology, mathematical analyses of electrical circuit models, a comprehensive comparison of calculated results with experimental results, and conclusions. *Communication Outcome, Numerical Literacy Outcome*
5. Discuss the importance of personal qualities such as personal responsibility, time management principles, self-esteem, sociability, self-management, integrity and honesty in school and in the workplace, and dynamics of change in the workplace. *Personal Development Outcome, Cultural Diversity and social Adaptation Outcome, Transitional Strategy*

\*Strategies and outcomes listed after instructional processes reference Pellissippi State's goals for strengthening general education knowledge and skills, connecting coursework to experiences beyond the classroom, and encouraging students to take active and responsible roles in the educational process.

#### **IV. Expectations for Student Performance\*:**

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

1. Solve problems in conversion from one number system to another. A
2. Solve problems in addition and subtraction using any number system. A
3. Solve problems using 2's complement arithmetic. A
4. Solve problems converting between binary and BCD, 2's complement, ASCII, GRAY or excess 3 code. B
5. Sketch output waveforms for logic expressions involving all logic gates when given input waveforms. C
6. Draw the equivalent logic circuit and visa-versa when given Boolean expressions. D
7. Solve problems involving simplification using Boolean Algebra. D
8. Design and build a BCD to seven segment decoder using logic gates. F
9. Sketch output waveforms when given an IC adder and input waveforms. E
10. Sketch output waveforms when given an IC comparator and input waveforms. E
11. Sketch the output waveforms when given an IC decoder or encoder and input waveforms. F
12. Sketch the output waveforms when given an IC multiplexer or demultiplexer and input

waveforms. F

13. Sketch output waveforms when given input waveforms for any type of flip-flop. G
14. Sketch output waveforms when given input waveforms for circuits involving several logic gates and IC's. G
15. Describe the operation and sketch appropriate waveforms when given an IC counter (Binary or BCD, synchronous or asynchronous). H
16. Describe the operation and sketch appropriate waveforms when given an IC shift register (serial or parallel). I
17. List the advantages and disadvantages of TTL vs CMOS. J
18. Program the device using appropriate software when given PLD with input and output conditions. K
19. Construct a 555 to meet specifications for a one shot. L
20. Construct a 555 to meet specifications for an astable multivibrator. L

\*Letters after performance expectations reference the course objectives listed above.

## **V. Evaluation:**

### A. Testing Procedures: 80% of grade

The evaluation in the classroom will be determined by a combination of chapter tests, homework, a final exam and laboratory activities. The percentage that each of these factors count and the frequency of tests and homework is left to the discretion of the instructor, but the following is offered as a guide:

Chapter Tests:	40%
Homework:	10%
Quizzes:	10%
Final Exam:	20%

### B. Laboratory Expectations: 20% of grade

The laboratory portion of the grade will be determined by a combination of performance within the lab and the quality of demonstrated comprehension of the lab report. A lab test and lab project may also be included. There will be at least twelve labs during the semester to go along with the classroom material:

1. Number Systems and the Microprocessor Trainer
2. Basic Logic Gates
3. Logic Probe, also Boolean Simplification
4. BCD to Seven Segment Logic, Karnough Maps (K Maps)
5. Continue Logic Probe, also BCD to Seven Segment Logic, converting to NAND and using Negative Logic
6. Programming a GAL to operate the logic for segment a, and again for segment b, without using simplification
7. Multiplexing
8. Multiplexing and De-Multiplexing
9. 555 Timer
10. JK Flip-Flops and Binary Counters, using the 555 timer as a clock
11. Counters, up/down

C. Field Work:

N/A

D. Other Evaluation Methods:

N/A

E. Grading Scale:

93 – 100 A

85 -- 92 B

70 -- 84 C

60 -- 69 D

Below 60 F

**VI. Policies:**

A. Attendance Policy:

Pellissippi State Technical Community College expects students to attend all scheduled instructional activities. As a minimum, students in all courses must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course (Pellissippi State Catalog). Individual departments/programs/disciplines, with the approval of the vice president of Academic and Student Affairs, may have requirements that are more stringent.

Attendance is required to all lab sessions unless excused by the instructor. Students missing more than four unexcused sessions will receive an "F" and no credit will be received. Students tardy past half an hour will be considered absent.

B. Other Policies:

The student is encouraged to read the regulations for student conduct in the PSTCC Catalog and Handbook