PELLISSIPPI STATE COMMUNITY COLLEGE
MASTER SYLLABUS

DIGITAL FUNDAMENTALS W/ LAB
EET 1310

Class Hours: 3.0  Credit Hours: 4.0
Laboratory Hours: 3.0  Revised: Spring 2011

Catalog Course Description:

A study of basic numbering systems, basic computer codes, Boolean algebra, basic logic gates, and logic simplification using Boolean algebra and Karnough 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 Course Materials:

Parts Kit: Approximate cost: $20.00

I. Week/Unit/Topic Basis:

<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
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<tbody>
<tr>
<td>1</td>
<td>Basic Principles of Digital Systems</td>
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<tr>
<td>2</td>
<td>Number Systems and Codes</td>
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<tr>
<td>3</td>
<td>Logic Gate Networks and Boolean Algebra</td>
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<tr>
<td>4</td>
<td>Combinational Logic</td>
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<tr>
<td>5</td>
<td>Combinational Logic</td>
</tr>
<tr>
<td>6</td>
<td>Functions of Combinational Logic</td>
</tr>
<tr>
<td>7</td>
<td>Functions of Combinational Logic</td>
</tr>
<tr>
<td>8</td>
<td>Introduction to Programmable Logic Devices</td>
</tr>
<tr>
<td>9</td>
<td>Flip-Flops and Related Devices</td>
</tr>
<tr>
<td>10</td>
<td>Counters</td>
</tr>
</tbody>
</table>
II. Course Goals*:

The course will:

A. Understand number systems (Binary, Octal, Hexadecimal). I, II
B. Understand binary codes. I, II
C. Understand the operation of basic logic gates (AND, OR, NOT, NAND, NOR). I, II
D. Understand the Boolean expression of logic functions and be able to simplify these expressions. I, II
E. Understand the operation of adders and comparators. I, II
F. Understand the operation of decoders, encoders, multiplexers, and demultiplexers. I, II
G. Understand basic flip-flop operations (D, RS, RST, and SK flip-flops). I, II
H. Understand basic counter circuits. I, II
I. Understand basic shift register circuits. I, II
J. Understand the advantages and disadvantages of different logic families. I, II
K. Understand and use programmable logic devices. I, II
L. Understand and use 555 timers. I, II
M. Demonstrate, as an individual and as a team member, library/information skills, time management skills, problem-solving skills, material management skills, and communication skills. I, II, III, IV, V

*Roman numerals after course goals reference goals of the Engineering Technology program (Career Program Goals and General Education Goals are listed http://www.pstcc.edu/departments/curriculum_and_instruction/syllabi/)

III. Expected Student Learning Outcomes*:

The student will 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

* Capital letters after Expected Student Learning Outcomes reference the course goals listed above.

IV. 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 ten labs during the semester to go along with the classroom material:
1. Basic Logic Gates.
2. Boolean Simplification.
3. BCD to Seven Segment Logic, Karnough Maps (K Maps).
4. Converting to NAND and using Negative Logic.
5. Programming a GAL to operate the logic for seven segment display.
7. 555 Timer.
8. JK Flip-Flops.
9. Counters, up/down.
10. System level design.

C. Field Work:

N/A

D. Other Evaluation Methods:

N/A

E. Grading Scale:

<table>
<thead>
<tr>
<th>Score</th>
<th>Grade</th>
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<tbody>
<tr>
<td>93 - 100</td>
<td>A</td>
</tr>
<tr>
<td>88 - 92</td>
<td>B+</td>
</tr>
<tr>
<td>83 - 87</td>
<td>B</td>
</tr>
<tr>
<td>78 - 82</td>
<td>C+</td>
</tr>
<tr>
<td>70 - 77</td>
<td>C</td>
</tr>
<tr>
<td>60 - 69</td>
<td>D</td>
</tr>
<tr>
<td>Below 60</td>
<td>F</td>
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V. Policies:

A. Attendance Policy:

Pellissippi State expects students to attend all scheduled instructional activities. As a minimum, students in all courses (excluding distance learning courses) must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of the Learning Division, may have requirements that are more stringent. In very specific circumstances, an appeal of the policy may be addressed to the head of the department in which the course was taken. If further action is warranted, the appeal may be addressed to the vice president of the Learning Division.

B. Academic and Classroom Misconduct

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices:
- Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
- Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services,
without proper documentation of the original source.
• Purchasing or otherwise obtaining prewritten essays, research papers, or materials prepared by another person or agency that sells term papers or other academic materials to be presented as one’s own work.
• Taking an exam for another student.
• Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.
• Any of the above occurring within the Web or distance learning environment.

C. Accommodations for disabilities:

Students who need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students must present a current accommodation plan from a staff member in Services for Students with Disabilities (SSWD) in order to receive accommodations in this course. Services for Students with Disabilities may be contacted by going to Goins 127, 132, 134, 135, 131 or by phone: 539-7153 or TTY 694-6429. More information is available at www.pstcc.edu/departments/swd/.