PELLISSIPPI STATE COMMUNITY COLLEGE
MASTER SYLLABUS

DIGITAL FUNDAMENTALS W/ LAB
EET 1310

Class Hours: 3   Credit Hours: 4

Laboratory Hours: 3   Date Revised: Fall 2016

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.

Prerequisites

None

Corequisites

None

Textbook(s) and Other Course Materials

Digital Fundamentals with PLD Programming. Floyd. Prentice-Hall.
Experiments in Digital Fundamentals with PLD Programming. Buchla. Prentice-Hall
Parts Kit: Approximate cost: $25.00

Week/Unit/Topic Basis

Week   Topic

1. Lecture: Digital Concepts; Lab: Experiment 1 Basic Laboratory Instruments

2. Lecture: Binary Number System; Lab: Experiment 3 Number Systems

3. Lecture: 2's Complements and Hexadecimal; Lab: Experiment 4 Logic Gates

4. Lecture: Digital codes – BCD, Gray, ASII; Lab: Experiment 5 More Logic Gates

5. Lecture: Review for test 1; Lab: Test 1

6. Lecture: Boolean Algebra and Logic Simplification; Lab: Experiment 8 Logic Circuit Simplification

7. Lecture: Combinational Logic Analysis; Lab: Design Seven Segment Driver

8. Lecture: Combinational Logic Analysis; Lab: Experiment 10 The Molasses Tank

9. Lecture: Functions of Combinational Logic; Lab: Experiment 11 Adder and Magnitude Comparator

10. Lecture: Review for Test 2; Lab: Test 2

11. Lecture: Latches, Flip-flops and Timers; Lab: Experiment 18 One Shots and Astable Multivibrators

12. Lecture: Counters; Lab: Experiment 20 Design of Synchronous Counters

13. Lecture: Shift Registers; Lab: Experiment 23 Shift Register Counters

14. Lecture: Review for Test 3 and Final; Lab: Test 3

15. Final Exam Period

Engineering Technology General Outcomes (Educational objectives)

I. Apply basic engineering theories and concepts creatively to analyze and solve technical problems

II. Utilize with a high degree of knowledge and skill equipment, instruments, software, and technical reference materials currently used in industry.

III. Communicate effectively using developed writing, speaking, and graphics skills.

IV. Assimilate and practice the concepts and principles of working in a team environment.

V. Obtain employment within the discipline or matriculate to a four year program in engineering or industrial technology

Engineering Technology Concentration Competencies

NOTE: At the program level all 6 competencies apply to roman numerals I – V of the Engineering Technology General Outcomes (Educational objectives) listed above.

Students will

A. Apply the knowledge, techniques, skills, and modern tools for the concentration of study to specifically defined engineering technology activities

B. Demonstrate the knowledge of mathematics, science, engineering and technology to engineering technology problems using developed practical knowledge

C. Conduct and report the results of standard tests and measurements, and conduct, analyze and interpret experiment or project results

D. Function effectively as a member of a technical team

E. Identify, analyze and solve specifically defined engineering technology-based problems

F. Employ Written, oral and visual communication in a technical environment

Course Goals

NOTE: Capital letters after course goals reference the competencies of the Engineering Technology concentrations listed above.

The course will

1. Understand differences of Digital systems vs Analog Systems. (A)

2. Understand number systems (Binary, Octal, Hexadecimal). (A, B)

3. Understand binary codes (A, B)

4. Understand the operation of basic logic gates (AND, OR, NOT, NAND, NOR). (A, B, C, D E, F)

5. Able to write the Boolean expression of logic functions and be able to simplify these expressions (A, B, C, D, E, F)

6. Understand the operation of adders and comparators. (A, B, C, D, E, F)

7. Understand the operation of decoders, encoders, multiplexers, and demultiplexers. (A, B, C)

8. Understand basic flip-flop operations (D, RS, RST, and SK flip-flops).. (A, B, C, D, E, F)

9. Understand basic counter circuits. (A, B, C, D, E, F)

10. Understand basic shift register circuits. (A, B)

11. Understand the advantages and disadvantages of different logic families. (A, B, C, D, E, F)

12. Understand and use programmable logic devices. (A, B, C, D, E, F)

13. Understand and use 555 timers. (A, B, C, D, E, F)

14. Work in a team environment during laboratory sessions and develop written reports to communicate the principles learned through the experiment. (C, D)

Expected Student Learning Outcomes

NOTE: Numbers after Expected Student Learning Outcomes reference the course goals listed above.

The student will
a) Identify digital devices and analog devices along with what their signal output (1)

b) Solve problems in conversion from one number system to another. (2)

c) Solve problems in addition and subtraction using any number system.. (2,3)

d) Solve problems using 2's complement arithmetic. (2)

e) Solve problems converting between binary and BCD, 2's complement, ASCII, GRAY or excess 3 code. (2, 3)

f) Sketch output waveforms for logic expressions involving all logic gates when given input waveforms. (2, 3, 4)

g) Draw the equivalent logic circuit and visa-versa when given Boolean expressions. (4, 5)

h) Solve problems involving simplification using Boolean Algebra. (4, 5)

i) Design and build a BCD to seven segment decoder using logic gates. (4, 5)

j) Sketch output waveforms when given an IC adder and input waveforms (6)

k) Sketch output waveforms when given an IC comparator and input waveforms. (6)

l) Sketch the output waveforms when given an IC decoder or encoder and input waveforms. (7)

m) Sketch the output waveforms when given an IC multiplexer or demultiplexer and input waveforms. (7)

n) Sketch output waveforms when given input waveforms for any type of flip-flop. (8)

o) Sketch output waveforms when given input waveforms for circuits involving several logic gates and IC's (4, 5, 6, 7, 8)

p) Describe the operation and sketch appropriate waveforms when given an IC counter (Binary or BCD, synchronous or asynchronous). (9)

q) Design a counter. (9, 14)

r) Describe the operation and sketch appropriate waveforms when given an IC shift register (serial or parallel). (10)

s) List the advantages and disadvantages of TTL vs CMOS. (11)

t) Program the device using appropriate software when given PLD with input and output conditions. (12)

u) Construct a 555 to meet specifications for a one shot. (13, 14)

Evaluation

Testing Procedures: 80% of grade

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

Laboratory Expectations: 20% of grade

The laboratories for all EET courses are an essential part of conveying the concepts to the student. The labs would closely follow the classes in content and in time of presentation so that the student is actually verifying these concepts to his or her self. The student will be able to apply the theory learned in class. The laboratory grade will be determined by a combination of performance within the lab and the quality and demonstrated comprehension of the lab report. There will be at least ten labs during the semester to go along with the classroom material.

Performance in labs (subjective) 50%
Lab Reports (neatness and content)   30%
Laboratory Test   20%

Field Work

Students shall participate in one class field trip. A report will be required that will be part of the laboratory grade.

Other Evaluation Methods

None

Grading Scale

A   93 - 100
B+   88 - 92
B   83 - 87
C+   78 - 82

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C       70 - 77
D       60 – 69
F       Below 60
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Policies

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 Academic Affairs, 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 Academic Affairs.

Academic Dishonesty

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.

Please see the Pellissippi State Policies and Procedures Manual, Policy 04:02:00 Academic/Classroom Conduct and Disciplinary Sanctions for the complete policy.

Accommodations for Disabilities

Students that 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 Disability Services (DS) in order to receive accommodations in this course. Disability Services (http://www.pstcc.edu/sswd/) may be contacted via Disability Services email or by visiting Alexander 130.