ILLINOIS VALLEY COMMUNITY COLLEGE

Course Outline

DIVISION: Career and Technical Programs

Course: ELT 2204 - Digital Microprocessor: Principles and Applications Electronics

Date: 2/24/09

Semester Hours: 5

Prerequisite(s): ELT 1204 or ELE 1200 or equivalent

Delivery Method:

- Lecture 3 Credit Hours
- Lab 2 Credit Hours
- Online
- Blended

Offered: Spring

IAI Equivalent – Only for Transfer Courses - go to http://www.itransfer.org:

CATALOG DESCRIPTION:
Introduction to basic logic gates and design procedures. Additional topics include adders, encoders, multiplexors, flip-flops, registers, counters, logic families and RAM and ROM; as well as a hands-on introduction to microprocessor principles on a discrete component level using machine level instructions. Numbering systems and logical thinking are used in conjunction with microprocessor board level training.
GENERAL EDUCATION GOALS ADDRESSED

Upon completion of the course, the student will be able:

☐ To apply analytical and problem solving skills to personal, social and professional issues and situations.
☐ To communicate orally and in writing, socially and interpersonally.
☐ To develop an awareness of the contributions made to civilization by the diverse cultures of the world.
☐ To understand and use contemporary technology effectively and to understand its impact on the individual and society.
☐ To work and study effectively both individually and in collaboration with others.
☐ To understand what it means to act ethically and responsibly as an individual in one’s career and as a member of society.
☐ To develop and maintain a healthy lifestyle physically, mentally, and spiritually.
☐ To appreciate the ongoing values of learning, self-improvement, and career planning.

EXPECTED LEARNING OUTCOMES AND RELATED COMPETENCIES:

Upon completion of the course, the student will be able to:

1. Count and convert each number system and code to each other coded system
   Competency 1.1    Convert Decimal Numbers
   Competency 1.2    Convert Binary Numbers
   Competency 1.3    Convert Octal Numbers
   Competency 1.4    Convert Hex Numbers
   Competency 1.5    Convert BCD Numbers
   Competency 1.6    Convert ASCII Code

2. Give correct symbols, truth tables, and Boolean equation for each Gate
   Competency 2.1.    Analyze an Inverter
   Competency 2.2.    Analyze an OR gate
   Competency 2.3.    Analyze an AND gate

3. Give correct symbols, truth tables, and Boolean equation for each Gate
   Competency 3.1    Analyze a NOR gate
   Competency 3.2    Analyze a NAND gate
   Competency 3.3    Analyze an XOR gate
   Competency 3.4    Analyze an XNOR gate
   Competency 3.5    Prove DeMorgan's Theorem

4. Use TTL circuits in an appropriate setting
   Competency 4.1.    Define a Digital Integrated Circuit
   Competency 4.2.    Show and use Pinouts of variable 7400 chips
   Competency 4.3.    Describe and Show TTL Characteristics
   Competency 4.4.    Build a Sinking and Sourcing Circuit

5. Use Boolean algebra and Karnaugh Maps
Competency 5.1. Use the correct Boolean equations
Competency 5.2. Build a Boolean equation from a circuit
Competency 5.3. Build a circuit from a Boolean equation
Competency 5.4. Simplify a circuit using Boolean algebra
Competency 5.5. Build a Karnaugh Map
Competency 5.6. Simplify a circuit using a Karnaugh Map

6. Use Arithmetic Logic
   Competency 6.1. Show binary Addition
   Competency 6.2. Show binary Subtraction
   Competency 6.3. Use Adders in a circuit
   Competency 6.4. Decipher negative numbers with 2’s compliment

7. Using Flip-Flops
   Competency 7.1. Interpret an RS latching Circuit
   Competency 7.2. Build truth tables for D Flip-Flop
   Competency 7.3. Build a JK Flip-Flop Circuit

8. Utilizing Counters and Buffers
   Competency 8.1. Define diverse Registers and Counters
   Competency 7.2. Build a counting circuit

9. Employer Expectations
   Competency 9.1. Perform different tasks as a team member
   Competency 9.2 Develop a time management plan
   Competency 9.3 Develop a Trouble Shooting Plan
   Competency 9.4 Evaluate the quality of a circuit

COURSE TOPICS AND CONTENT REQUIREMENTS:
I: Number systems and codes
   1. Decimal
   2. Binary
   3. Codes
   4. Octal
   5. Hex
   6. Conversions
II. Gates
   1. Inverters
   2. Or
   3. And
   4. Boolean Algebra
III. Logic Gates
   1. Nor
   2. Nand
   3. Xor
   4. Xnor
   5. Demorgan's Theorems
IV. TTL Circuits
   1. Digital Circuits
2.  7400 Devices  
3.  TTL Characteristics  
4.  Sinking and Sourcing  

V.  Boolean Algebra and Karnaugh maps  
   1.  Boolean Relationships  
   2.  Algebraic Simplification  
   3.  Karnaugh Maps  
   4.  Pairs, Quads, and Octets  
   5.  Karnaugh Simplifications  

VI. Arithmetic Logic Units  
   1.  Binary Addition  
   2.  Binary Subtraction  
   3.  Adders  
   4.  Signed Numbers  
   5.  2's Compliment  

VII. Flip-Flops  
   1.  RS Latches  
   2.  Clocking  
   3.  D Latches  
   4.  D Flip-Flops  
   5.  JK Flip-Flops  
   6.  Master-Slave Flip-Flops  

VIII. Registers and Counters  
   1.  Buffer  
   2.  Shift  
   3.  Ripple Counters  
   4.  Ring Counters  
   5.  Three State Registers  

IX. Memories  
   1.  ROM's  
   2.  PROM's and EPROM's  
   3.  RAM's  
   4.  EEPROM's  
   5.  TTL Memory  
   6.  Addressing  

X.  Employer Expectations  
   1.  Team Work  
   2.  Time Management  
   3.  Trouble Shooting  
   4.  Quality  

**INSTRUCTIONAL METHODS:**  
Lecture  
Demonstration  
Working in groups
Think Tank Modules
Laboratory exercises
Quizzes

INSTRUCTIONAL MATERIALS:
Digital Computer Electronics, Malvino, Glenco Publishing
Simulation Software
Lab Component Hardware

STUDENT REQUIREMENTS AND METHODS OF EVALUATION:
Required assignments: Methods of Evaluation:
Mandatory lab attendance Short quizzes
Assigned reading Quizzes, Tests Completion of lab assignments
Lab Reports written and oral
Assigned homework Home work questions
Midterm exams
Lab practical exam Final exam

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<th>Percentage</th>
<th>Grade</th>
<th>Required assignments</th>
<th>Methods of Evaluation</th>
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<td>90% - 100%</td>
<td>A</td>
<td>Labs and Lab Reports</td>
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<td>80% - 89.9%</td>
<td>B</td>
<td>Quizes and Tests</td>
<td>40%</td>
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<td>70% - 79.9%</td>
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<td>Midterm and Finals</td>
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<td>60% - 69.9%</td>
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<td>below 60%</td>
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OTHER REFERENCES

Hints for studying this course:

1. Pay close attention to the instructor’s lectures. If you do not understand what he is trying to explain, hold up your hand for attention, and when recognized, clearly and concisely ask him to explain what you do not understand.
2. Take notes to study later at your leisure. Take notes even if you do not intend to study them. Just the action of taking notes re-enforces the thought in your mind.
3. Read and re-read the text assignment thoroughly. When necessary, turn back to the parts of the text you have already studied.
4. Explain to your fellow students, after class, what you have learned in class. Try to do this in your own words, not in the instructor’s words, not in the textbook words. This will help you understand what you have been learning.
5. Work the assigned problems. Working and re-working the problems, and similar problems, will help you remember the steps you have taken in solving the problems, and helps in remembering what you have been taught.
6. Study. This is the most important one of all.

Form Revised: 3/2/05