Fox Valley Technical College

10605130 Digital 1

Course Outcome Summary

Course Information

Description	Introduces digital electronics including Boolean, the operation of logic gates, and the theory of combination logic circuits. Laboratory activities are performed to verify the theory.
Career Cluster	Science, Technology, Engineering and Mathematics
Instructional Level	Associate Degree
Total Credits	1.00
Total Hours	27.00

Types of Instruction

Instruction Type	Credits/Hours
Lab	1 Credit/27 Hours

Course History

Revised By	Kaye Krueger (kruegek)
Last Approval Date	9/11/2014

Textbooks

Digital Electronics - An Integrated Laboratory Approach
Bartelt, Terry L. M.
Prentice-Hall
ISBN: 9780130931023

Employability Essentials

1. **Act Responsibly - Apply ethical standards in both personal and professional behavior.**
   Status *Active*

2. **Adapt to Change - Anticipate changes and positively respond to them.**
   Status *Active*

3. **Communicate Effectively and Respectfully - Apply appropriate writing, speaking, and listening skills across various settings to engage diverse audiences.**

Status *Active*

4. Think Critically and Creatively - Apply independent and rigorous reasoning that leads to informed decisions, innovation and personal empowerment.
Status *Active*

5. Work Collaboratively - Work collaboratively with others to complete tasks, solve problems, resolve conflicts, provide information, and offer support.
Status *Active*

Program Outcomes

1. Apply electronic theory to practice.
Status *Active*

Summative Assessment Strategies
1.1. TSA

Criteria
1.1. You mathematically analyze a circuit or system
1.2. You simulate a circuit or system
1.3. You construct a circuit or system according to schematics or other documentation
1.4. You perform circuit or system measurements to collect data
1.5. You analyze data to validate predicted outcome

2. Operate test equipment.
Status *Active*

Summative Assessment Strategies
2.1. TSA

Criteria
2.1. You demonstrate measurement of electrical and/or electronic signals
2.2. You demonstrate measurement of electrical and/or electronic quantities
2.3. You demonstrate measurement of electrical and/or electronic components
2.4. You use test equipment to generate electrical and/or electronic signals
2.5. You apply appropriate safety precautions

3. Build electronic circuits and systems.
Status *Active*

Summative Assessment Strategies
3.1. TSA

Criteria
3.1. You assemble a prototype for operation
3.2. You demonstrate soldering and de-soldering techniques
3.3. You apply appropriate antistatic precautions
3.4. You identify appropriate interfaces
3.5. You set up programmable devices and/or systems
3.6. You apply appropriate safety precautions

4. Evaluate the operation of electronic circuits or systems.
Status *Active*

Summative Assessment Strategies
4.1. TSA

Criteria
4.1. You determine the correct operation of circuits or systems

4.2. You identify incorrect operation of circuits or systems
4.3. You isolate causes of failures in circuits or systems
4.4. You correct failures in circuits or systems

5. Communicate technical information.

Status *Active*

Summative Assessment Strategies

5.1. TSA

Criteria

5.1. You interpret electrical and/or electronic diagrams
5.2. You create electrical and/or electronic diagrams
5.3. You interpret technical reports and documents
5.4. You use appropriate terminology in speaking and writing
5.5. You interpret documentation of electronic devices and systems
5.6. You locate necessary resources and pertinent information to perform work functions

Course Competencies

1. Differentiate between digital and analog electronics

Status *Active*

Assessment Strategies

1.1. Written exam

Criteria

1.1. Student must pass the written exam with a 70% or better.

Learning Objectives

1.a. Categorize variables as being either analog or digital in nature.
1.b. Describe the difference between analog and digital signals.
1.c. Describe all the differences between memory and logic devices.
1.d. Describe all the advantages of digital techniques over analog.

2. Identify basic aspects of digital electronics

Status *Active*

Assessment Strategies

2.1. Written exam

Criteria

2.1. Student must pass the written exam with a 70% or better.

Learning Objectives

2.a. Define the following terms: Bit Nibble Word
2.b. Count in binary.
2.c. Convert from decimal to binary, and binary to decimal.
2.d. Define the seven basic logic devices: AND, NAND, INVERTER, EXCLUSIVE NOR, OR, NOR, EXCLUSIVE OR
2.e. Identify the truth table for each of the seven basic logic devices.
2.f. Identify the logic symbols for each of the seven basic logic devices.
2.g. Identify which logic state is recognized by a TTL IC input it if is left disconnected.
2.h. Write the Boolean expressions for the seven basic logic devices.
2.i. Draw the waveform diagrams for each of the seven basic logic devices.
2.j. Use pin diagrams of DIP (Dual In-line Package) integrated circuits to construct logic circuitry utilizing the basic logic devices.
2.k. Define noise and give examples of its origin.
2.l. Identify the type of logic gate function by viewing one of seven circuits using the universal NAND gate.
2.m. Determine if an ExOR gate operates as an inverter or a straight wire when a logic Low or a logic High is applied to one of its input leads.

3. Figure out data conversion circuits

Status *Active*

Assessment Strategies

3.1. Written exam

Criteria

3.1. Student must pass the written exam with a 70% or better.

Learning Objectives

3.a. Describe the operation of a tri-state buffer and explain what it is used for.
3.b. List practical applications of decimal, binary, octal, BCD, and hexadecimal number systems.
3.c. Count in binary, octal, BCD (Binary Coded Decimal), and hexadecimal.
3.d. Convert from decimal to octal, and octal to decimal.
3.e. Convert from decimal to BCD, and BCD to decimal.
3.f. Convert from decimal to hexadecimal, and hexadecimal to decimal.
3.g. Convert from binary to octal and octal to binary.
3.h. List the three general categories into which the different combination circuits fall based on their functions.
3.i. Write the definitions for the following terms: Encoder, Nibble, Decoder, Bubble, Overbar,MSB, LSB, Enable, BCD.
3.j. Describe the operation of each type of combination circuit in the Unit 2 material with the use of truth tables, waveform diagrams, and block diagrams.
3.k. Describe the operation of combination circuits in IC form by interpreting block diagrams, pin diagrams, and function tables.
3.l. Determine how signals develop at each individual gate throughout the circuitry based on binary data applied to the inputs of a combination circuit.
3.m. Determine the active and inactive logic states present at inputs and outputs of a combination circuit by interpreting the absence or presence of overbars and bubbles.
3.n. Identify the meaning of the letters A, B, C and D at the input or output leads of and encoder or decoder.
3.o. Label the seven segments of an LED display by using letters.

4. Construct data transfer and processing circuits

Status *Active*

Assessment Strategies

4.1. Written exam

Criteria

4.1. Student must pass the written exam with a 70% or better.

Learning Objectives

4.a. Write the definitions for the following terms: Nibble, Multiplexer, Demultiplexer, Parity Bit, Data Selector, Noise, Data Distributer, Enable, Transient, Parity
4.b. Describe the operation of each type of combination circuit in the Unit 3 material with the use of truth tables, waveform diagrams, and block diagrams.
4.c. Describe the operation of combination circuits in IC form by interpreting block diagrams, pin diagrams, and function tables.
4.d. Determine which logic states will develop at a magnitude comparator's output pins based on the 4-bit binary numbers applied to inputs A and B of a magnitude comparator, and the binary bits present at its expansion input pins,
4.e. Write a function table, similar to the one on page 148 of the textbook, to show the proper operation of a Multiplexer/Demultiplexer configuration.
4.f. Determine how signals develop at each individual gate throughout the circuit based on binary bits applied to the inputs of a full adder consisting of various logic gates.
4.g. Determine the active and inactive logic states present at inputs and outputs of a combination circuit by interpreting the absence or presence of overbars and bubbles.
4.h. Calculate using multi-bit binary numbers.
4.i. Demonstrate basic troubleshooting of combination circuits.

Grant Award

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Course Learning Plans and Performance Assessment Tasks

Type	Title	Source	Status
PAT	Introduction to Digital Electronics Exam	Course	Active
PAT	Data Conversion Circuits Exam	Course	Active
PAT	Data Transfer and Processing Circuits Exam	Course	Active
LP	Introduction to Digital Electronics	Course	Active
LP	Data Conversion Circuits	Course	Active
LP	Data Transfer and Processing Circuits	Course	Active