STRANDS AND STANDARDS
DIGITAL ELECTRONICS

Learning that works for Utah
CTE®

Course Description

This is an entry-level course to introduce students to electricity and electronics. Students will develop skills to assemble electronic components and operate electrical/electronic equipment used in engineering, product development, and manufacturing.

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	38.01.00.00.022
Concurrent Enrollment Core Code	38.01.00.13.022
Prerequisite	N/A
Skill Certification Test Number	652
Skill Certification Cut Score	**68%**
Test Weight	0.5
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Technology & Engineering
Endorsement 2	Electronics

STRAND 1

Students will understand, demonstrate, and practice safe working habits in an electronics lab.

Standard 1

Students will demonstrate a habit of Electrical Safety.

- Students will demonstrate safety while using test equipment.
- Students will properly care and maintenance of test equipment.

Standard 2

Demonstrate safe use of a Soldering Iron

- Students will identify potential hazards before and during use and take proper precautions.
- Students will properly care for, maintain, and store soldering irons and soldering materials (solder, wick, tips, etc.)

Standard 3

Students will recognize safety hazards and demonstrate the proper behaviors to remove or minimize hazards.

- Clean as you go
- Always wear safety glasses and appropriate PPE (Personal Protective Equipment).
- Deenergize circuits/equipment before testing. Demonstrate proper safety while testing/trouble shooting.

Performance Skill

Students can complete a safety test without error (100%) before using any tools or shop equipment.
Students will demonstrate proper use of PPE.
Student will demonstrate safe practices while working with electricity.

STRAND 2

Students will learn to describe and demonstrate the use of different number systems in digital electronics.

Standard 1

Understand the difference between analog and digital

Standard 2

Understand the analog and digital number systems used

- Decimal number system – Analog
- Binary number system – Digital

Standard 3

Convert between decimal and binary

Standard 4

Recognize the use of hexadecimal number systems in defining locations in memory
(Students must recognize where hexadecimal is used but does not need to understand how it is used)

Performance Skill

Students can accurately convert between decimal and binary

STRAND 3

Students will understand the functions of typical logic gates and their logic states.

Standard 1

Describe the function of and create truth tables for typical logic gates.

- AND, NAND
- OR, NOR
- XOR
- Buffer (YES), Inverter (NOT)

Standard 2

Understand the difference between TTL and CMOS digital logic circuits including advantages and disadvantages of using each.

Standard 3

Identify logic gates by their associated chip number

- AND (7408)
- NAND (7400)
- OR (7432)
- NOR (7402)
- XOR (7486)
- Buffer (YES) (7407)
- Inverter (NOT) (7404)

Performance Skill

- Given a logic gate diagram with associated binary inputs, students will be able to determine the logic outputs for the diagram.
- Using simulation software, students will be able to recreate a given logic diagram and verify the operation of the logic diagram.

STRAND 4

Students will understand, construct, and test combinational logic circuits.

Standard 1

Given a digital design situation or schematic:

- Develop a truth table for the digital design situation
- Develop a Boolean Expression for the truth table.
- Simplify the Boolean Expression as needed using various theorems and logical equivalencies (including Karnaugh Maps).
- Develop a combinational logic diagram of the digital logic gates needed to perform the function of the digital design situation.

Standard 2

Using simulation software, construct the combinational digital logic circuit and verify the operation of the digital design solution.

Standard 3

Construct a combinational logic circuit to verify the operation of the digital design solution.

Standard 4

Use a logic probe to test and verify logic levels in all parts of combinational logic circuits.

Performance Skill

- Students can design and construct a logic circuit to meet the needs of a design challenge
- Students can use a logic probe to fix a broken/buggy logic circuit

STRAND 5

Students will demonstrate an understanding of microcontrollers.

Standard 1

Students will learn how to use the basic elements of a programming language

- Declare, initialize, and assign values to constants and variables.
- Demonstrate the ability to use input and output commands.
- Demonstrate the ability to make decisions with IF – THEN – ELSE statements
- Create loops using commands like FOR, WHILE, SELECT, etc.
- Troubleshoot bugs within a program

Standard 2

Students will use microcontrollers to control digital outputs

Standard 3

Students will use digital inputs and microcontrollers to control digital outputs

Standard 4

Students will use analog inputs and microcontrollers to control digital outputs

Standard 5

Students will use microcontrollers and Pulse Width Modulation to control analog outputs

Performance Skill

- Students can program a microcontroller
- Students can use a microcontroller to control digital inputs and outputs
- Students can use a microcontroller to control analog inputs and outputs

Skill Certification Test Points by Strand

Test Name	Test #	Number of Test Points by Strand										Total Points	Total Questions
		1	2	3	4	5	6	7	8	9	10		
Electronics 2	652												