



Digital Electronics

Course Number	494460
Grade Level	10-12
Career Cluster	Advanced Manufacturing
Pathway	Engineering
Course Sequence	Level 3
CTSO	TSA
Industry Recognized Credential	LINK
Minimum Equipment List	LINK
Course Description	Students explore the foundations of computing by engaging in circuit design processes to create combinational logic and sequential logic (memory) as electrical engineers do in industry.

CIP Code	CIP Title
14.1001	Electrical and Electronics Engineering.
14.3301	Construction Engineering.
14.4101	Electromechanical Engineering.
14.4201	Mechatronics, Robotics, and Automation Engineering.
14.4701	Electrical and Computer Engineering.
14.4802	Power Plant Engineering.
15.0306	Integrated Circuit Design Technology/Technician.
15.1305	Electrical/Electronics Drafting and Electrical/Electronics CAD/CADD.
47.0105	Industrial Electronics Technology/Technician.

SOC Code	SOC Title
17-2061	Computer Hardware Engineers
17-2071	Electrical Engineer
17-2199	Engineers, All Other
17-3012	Electrical and Electronics Drafters
17-3023	Electrical and Electronic Engineering Technologists and Technicians
49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment
17-2072	Electronics Engineers, Except Computer



Course Standards

Digital Electronics Content Standard 1.0 Explore the fundamental components, concepts, equipment, and skill sets associated with circuit design.	
Performance Indicator 1.1 Learn to distinguish between analog and digital components	
1.1.1	Explore basic circuits and the measurement tools used to characterize and validate calculations that predict a circuit's behavior.
1.1.2	Describe electrical circuits, voltage, current, resistance, series and parallel circuits, Ohm's law, and how to use a digital multimeter to measure voltage.
1.1.3	Become familiar with common components such as resistors, capacitors, light emitting diodes (LEDs), seven-segment displays, combinational logic gates, and sequential logic gates.
Performance Indicator 1.2 Explore fundamental circuit designs.	
1.2.1	Explore fundamental circuit designs and manipulate circuits to understand their function.
1.2.2	Explore the examples that combine analog, digital combinational logic, and digital sequential logic.
Standard 2.0 Explore creation of circuits.	
Performance Indicator 2.1 Explore AND, OR, Inverter (AOI) combinational logic circuit design.	
2.1.1	Apply concepts related to binary number systems, truth tables, and Boolean expressions.
2.1.2	Using the systematic approaches of AOI simplification, AOI logic analysis, and AOI implementation, students will learn to take design specifications and translate them into the most efficient circuit possible.
Performance Indicator 2.2 Apply the combinational logic design process.	
2.2.1	Learn steps required to transform a set of written design specifications into a functional combinational logic circuit implemented with either NAND only or NOR only logic.



2.2.2	Compare simple solutions to design a more complex solution.
Performance Indicator 2.3 Apply the combinational logic design process.	
2.3.1	Explore hexadecimal and octal number systems, XOR, XNOR, and binary adders, 2's complement arithmetic, and multiplexers/demultiplexers.
2.3.2	Examine the use of seven segment displays in designs, and carrying multiple signals through the same pathway in a circuit.
2.3.3	Apply learning to design a circuit in which they define some of the design specifications themselves.
Standard 3.0 Evaluate Sequential Logic	
Performance Indicator 3.1 Analyze Sequential Logic Circuit Design	
3.1.1	Examining the basic operation of the two most common flip-flop types, the D and J/K flip-flops.
3.1.2	Study application of flip-flops for asynchronous counters, synchronous counters, and state-machines.
Performance Indicator 3.2 Explore Asynchronous Counters	
3.2.1	Apply steps required in the process for designing Small Scale Integration (SSI) and Medium Scale Integration (MSI) asynchronous counters.
3.2.2	Analyze the design of synchronous counters.
Standard 4.0 Analyze Controlling Real World Systems	
Performance Indicator 4.1 Model complex real-world problems.	
4.1.1	Learn and apply the state machine design process.
4.1.2	Create programs (Sketches) to control systems with unique sensors, human input controls, motors, and servos.



Contributors

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