Ohio CTE

Digital Electronics (2025)

Business Operations/21st Century Skills: Learners apply principles of economics, business management, marketing and employability in an entrepreneur, manager and employee role to the leadership, planning, developing and analyzing of business enterprises related to the career field. 1

1 **Employability Skills: Develop career awareness and employability skills (e.g. face-to-face, online) needed for gaining and maintaining employment in diverse business settings.** 1.1

1 Identify the knowledge, skills, and abilities necessary to succeed in careers. 1.1.1

2 Identify the scope of career opportunities and the requirements for education, training, certification, licensure, and experience. 1.1.2

3 Develop a career plan that reflects career interests, pathways, and secondary and postsecondary options. 1.1.3

4 Describe the role and function of professional organizations, industry associations, and organized labor and use networking techniques to develop and maintain professional relationships. 1.1.4

5 Develop strategies for self-promotion in the hiring process (e.g. filling out job applications, résumé writing, interviewing skills, portfolio development). 1.1.5

6 Explain the importance of work ethic, accountability, and responsibility and demonstrate associated behaviors in fulfilling personal, community, and workplace roles. 1.1.6

7 Apply problem-solving and critical-thinking skills to work-related issues when making decisions and formulating solutions. 1.1.7

8 Identify the correlation between emotions, behavior, and appearance and manage those to establish and maintain professionalism. 1.1.8

9 Give and receive constructive feedback to improve work habits. 1.1.9

10 Adapt personal coping skills to adjust to taxing workplace demands. 1.1.10

11 Recognize different cultural beliefs and practices in the workplace and demonstrate respect for them. 1.1.11

12 Identify healthy lifestyles that reduce the risk of chronic disease, unsafe habits and abusive behavior. 1.1.12

3 **Business Ethics and Law: Analyze how professional, ethical, and legal behavior contributes to continuous improvement in organizational performance and regulatory compliance.** 1.3

1 Analyze how regulatory compliance affects business operations and organizational performance. 1.3.1

Follow protocols and practices necessary to maintain a clean, safe, and healthy work environment. 1.3.2

Skip to main content

3 Use ethical character traits consistent with workplace standards (e.g. honesty, personal integrity, compassion, justice). 1.3.3

5 Access and implement safety compliance measures (e.g. quality assurance information, safety data sheets [SDSs], product safety data sheets [PSDSs], U.S. Environmental Protection Agency [EPA], United States Occupational Safety and Health Administration [OSHA]) that contribute to the continuous improvement of the organization. 1.3.5

7 Identify the labor laws that affect employment and the consequences of noncompliance for both employee and employer (e.g. harassment, labor, employment, employment interview, testing, minor labor laws, Americans with Disabilities Act, Fair Labor Standards Acts, Equal Employment Opportunity Commission [EEOC]). 1.3.7

8 Verify compliance with computer and intellectual property laws and regulations. 1.3.8

9 Identify potential conflicts of interest (e.g., personal gain, project bidding) between personal, organizational and professional ethical standards. 1.3.9

Electrical/Electronics: Learners apply principles of electricity and electronics related to electronic theory, alternating and direct current, electronic components, electronic skills, digital electronics and power supplies. Knowledge and skills may be applied to fundamentals of electricity, analyzing and evaluating circuits, assembling components into electrical circuits, creating circuits to perform tasks and operations, wiring components to construct a communications system and providing power to an electrical system. 2

1 **Electrical and Electronic Theory: Explain electrical and electronic principles and theory.** 2.1

1 Describe the structure of atoms and their relationship to electricity. 2.1.1

5 Define the units of measurement for voltage, current, power and resistance. 2.1.5

6 Describe the relationships between voltage, current, resistance and power in circuits. 2.1.6

7 Determine voltage, current, resistance and power in circuits using Ohm's Law, Kirchhoff's Law and Watt's Law. 2.1.7

8 Describe the purpose of grounding and common methods used for grounding. 2.1.8

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2 **Circuits: Construct and analyze alternating current (AC) and direct current (DC) circuits.** 2.2

1 Compare conductors and insulators. 2.2.1

5 Explain the uses of series, parallel and series-parallel circuits. 2.2.5

6 Construct and troubleshoot series, parallel and series-parallel circuits. 2.2.6

7 Analyze wiring schematics and diagrams for accuracy, function, and performance characteristics (e.g., time constants, current flow, impedance, signal timing, etc). 2.2.7

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3 **Electronic Components: Describe the functions and purposes of electronic components.** 2.3

1 Identify resistor values from color codes or other marks. 2.3.1

Compare resistor compositions and their uses. 2.3.2

Identify symbols for electronic components. 2.3.3

Skip to main content

4 **Electronic Connections: Connect individual components into an electrical circuit.** 2.4

1 Define the purpose of a connection and the differences between a good and bad connection. 2.4.1

2 Describe methods of electrical connections and the purpose for each method. 2.4.2

3 Select the type of electrical connection for electrical components. 2.4.3

4 Protect circuit boards from electrostatic discharge (ESD). 2.4.4

5 Combine components per wiring schematics, block diagrams, and flow charts. 2.4.5

6 Select and install terminal strip according to wiring diagram and/or schematics. 2.4.6

8 Use diagnostic tools to troubleshoot circuits effectively (signal generator, oscilloscope, multimeter etc.) 2.4.8

5 **Digital Electronics: Create circuits to perform tasks and operations.** 2.5

1 Identify the numbering systems, codes, arithmetic operations, Boolean operations, and simplification methods used in digital electronics. 2.5.1

2 Convert number systems (e.g., binary coded decimal (BCD) to decimal, and decimal to BCD) and perform arithmetic operations. 2.5.2

3 Understand and apply DeMorgan's Theorem to simplify logic expressions and digital circuits using basic logic gates, demonstrating the ability to analyze and modify circuit designs 2.5.3

4 Describe the purpose and use of logic gates (e.g., discrete and medium scale integration [MSI] gates, latches, flip-flops) and demonstrate understanding through the use of truth tables. 2.5.4

5 Design and implement combinational logic circuits (e.g., adders, subtractors, multiplexers, demultiplexers, encoders, decoders), including the use of Arithmetic Logic Units (ALUs) for solving arithmetic and logical problems. 2.5.5

6 Simplify Boolean expressions using methods like Karnaugh Maps (K-Maps) and apply them in the design of combinational logic circuits (e.g., decoders, adders, subtractors, multiplexers). 2.5.6

7 Design and implement sequential circuits using flip-flops, counters, and shift registers. 2.5.7

8 Understand and explain the purpose and operation of asynchronous and synchronous counters in digital systems. 2.5.8

9 Design and troubleshoot digital circuits based on schematics, using both solder and solderless techniques. 2.5.9

10 Identify and explain the purpose of memory in control systems, including types like RAM, ROM, and EEPROM. 2.5.10

.1 Design and analyze digital-to-analog and analog-to-digital circuits. 2.5.11

Skip to main content

12 Explain the operation of digital buses and demonstrate their use in connecting components in digital systems. 2.5.12

13 Explain and apply the use of pulsers, logic probes, and other diagnostic tools in troubleshooting digital circuits. 2.5.13

14 Design a schematic for a digital circuit, ensuring proper functionality and clarity. 2.5.14

15 Determine fan-out, propagation delays, and their impact on the performance of digital circuits. 2.5.15

16 Analyze and optimize power consumption in digital circuits, particularly in embedded systems. 2.5.16

17 Utilize counters in circuits for operations like counting, timing, and data sequencing. 2.5.17

18 Troubleshoot and modify digital circuits based on schematics and circuit diagrams. 2.5.18

19 Determine and calculate the output frequency and performance of digital circuits. 2.5.19

20 Utilize memory in a control system for storing and accessing data. 2.5.20

Design and Development: Learners apply principles of design and development related to the design process, sketching and visualization, modeling, drafting, materials and production and process design. 5

8 **Schematic Interpretation: Read, interpret, and utilize schematics to produce accurate products.** 5.8

1 Identify and interpret standard symbols used in schematics. 5.8.1

2 Recognize and label key components and systems within a schematic 5.8.2

3 Trace the flow of systems of schematic diagrams. 5.8.3

4 Utilize reference notes and legends to clarify details and specifications of schematics. 5.8.4

5 Identify discrepancies or errors in a schematic. 5.8.5

Technical Math and Science: Learners develop a comprehensive understanding of the fundamental principles and applications of technical mathematics and scientific concepts. Learners will perform precise measurements, interpret technical drawings, and apply scientific principles to sol ma problems. 9

Skip to main content

4 **Measurement and Interpretation: Interpret drawings and documentation and perform measurements.** 9.4

3 Identify measuring systems and convert between systems. 9.4.3

5 Skill in taking accurate measurements of material properties, components, and finished products using appropriate measuring tools & equipment 9.4.5

7 Ability to utilize a variety of different measuring instruments 9.4.7

8 Identify advanced measuring techniques and understand how they are being used to measure work pieces (Probing, Scanning etc..) 9.4.8

Maintenance and Safety: Learners apply principles of protection, prevention and mitigation to create and maintain safe working conditions at manufacturing sites. Knowledge and skills may be applied in all aspects of personal and site safety, including handling materials, using tools and equipment, working with and around electricity and using personal protective equipment. 10

1 **Site Safety: Handle materials, prevent accidents and mitigate hazards.** 10.1

- 1 Knowledge of safety standards and regulations, including Hazard Communication (HAZCOM) and Occupational Safety and Health Administration (OSHA) requirements (e.g., Working at Heights, Confined Space) 10.1.1
- 2 Knowledge of risk identification, evaluation, and mitigation strategies 10.1.2
- 5 Identify source of electrical and mechanical hazards and use shut-down and established lock out/tag-out procedures. 10.1.5
- 8 Identify the location of emergency flush showers, eyewash fountains, Safety Data Sheets (SDSs), fire alarms and exits. 10.1.8
- 14 Explain the role of third party certification (UL, IE, OSHA, etc.) 10.1.14
- 15 Apply information in the National Electrical Code (NEC) and other applicable codes when working on a job 10.1.15

2 **Personal Safety: Practice personal safety.** 10.2

- 3 Select, use, store, maintain and dispose of personal protective equipment (PPE) appropriate to job tasks, conditions and materials. 10.2.3
- 5 Identify, inspect and use safety equipment appropriate for a task. 10.2.5
- 6 Use safe practices when working with electrical, mechanical, or other equipment. 10.2.6
- 8 Safely operate manual, electrical-powered and pneumatic tools. 10.2.8