Ohio CTE

AC Electronic Circuits (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

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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 Theory: Explain electrical and electronic principles and theory.** 2.1

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

3 Explain methods of producing electrical current. 2.1.3

4 Compare alternating current (AC) and direct current (DC). 2.1.4

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

9 Evaluate frequency and phase for singular and multi-phase systems. 2.1.9

10 Understand the principles of singular and multi-phase power systems including their operation and applications. 2.1.10

12 Compare peak (PK), root mean square (RMS) and average values. 2.1.12

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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

2 Explain step-up/step-down voltage methods. 2.2.2

3 Describe lamination and explain why laminations are used. 2.2.3

4 Identify the function of inductors and capacitors in series and parallel circuits. 2.2.4

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

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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

8 Use circuit theorems in circuit analysis (e.g., Maximum power transfer, Thevenin, Source Transformation). 2.2.8

9 Identify and differentiate between different types of circuits (RC, RL, RCL, etc) 2.2.9

10 Explain steady-state behavior and how circuits respond under different conditions 2.2.10

12 Use analysis techniques in circuit analysis (e.g., mesh, loop, superposition, single & double subscript notation). 2.2.12

13 Analyze the behavior of capacitors and inductors in AC circuits, including time constants and impedance. 2.2.13

14 Design and implement simple analog filters using capacitors, inductors, and resistors. 2.2.14

15 Troubleshoot and diagnose faults in circuits, identifying common issues such as open circuits, short circuits, faulty components (e.g., capacitors, resistors), and wiring issues. 2.2.15

16 Explain the role of AC circuits in real-world applications (power supplies, audio amplification, motor control etc.) 2.2.16

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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

2 Compare resistor compositions and their uses. 2.3.2

3 Identify symbols for electronic components. 2.3.3

5 Identify types of transistors and diodes and explain their uses (e.g., Darlington pairs, unijunction transistors, Gunn diodes, field effect transistors [FETs] and metal-oxide semiconductor field- effect transistor [MOSFETs], N- and P- channel junction field effect transistors [JFETs]). 2.3.5

6 Compare the purpose and function of thyristors (e.g., diacs, triacs, and varisters). 2.3.6

7 Describe the purpose and operation of zener diodes. 2.3.7

11 Define surface mount components. 2.3.11

15 Design and analyze basic analog signal processing circuits, including amplifiers, oscillators, and mixers. 2.3.15

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

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

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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

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7 Power Supplies: Provide power to electrical circuits. 2.7

1 Identify the differences between transformer-powered supplies and line-connected supplies. 2.7.1

2 Select and install filters. 2.7.2

3 Construct and install regulated power supplies. 2.7.3

4 Select and install fuses and circuit breakers. 2.7.4

5 Select and construct half-wave, full-wave and bridge rectifiers. 2.7.5

6 Select and install power conditioning, isolation transformers, surge suppressors and uninterruptible power supplies. 2.7.6

7 Design, analyze, and demonstrate an understanding of basic filter circuits (low-pass, high-pass, band-pass, and band-stop filters). 2.7.7

8 Design and implement AC to DC conversion circuits, including full-wave, half-wave, and bridge rectifiers. 2.7.8

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 un fu an

1 Physics of Engineering: Learn the fundamentals of physics as it relates to engineering. 9.1

1 Display and interpret numbers in scientific notation and logarithmic scales 9.1.1

Describe and convert SI and US system units of measurement. 9.1.2

Identify and use both metric and inch rules. 9.1.3

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technical mathematics and scientific concepts. Learners will perform precise measurements, interpret technical drawings, and apply scientific principles to solve engineering and manufacturing problems. 9

- 4 Express physical quantities with appropriate number of significant digits, units and dimensions. 9.1.4
- 5 Perform operations on whole numbers, fractions and mixed numbers. 9.1.5
- 6 Analyze measurements and perform technical calculations. 9.1.6
- 7 Read and interpret charts and tables to analyze data and formulate outcomes. 9.1.7

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 equipment (eyewash fountains, Safety Data Sheets (SDSs), fire alarms, fire extinguishers, etc) and utilize them when necessary. 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

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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