**Course Description**

Students will apply the processes of digital circuit theory, combinational and sequential logic as it relates to circuit design and operation. Students will identify numbering systems, arithmetic and Boolean operations and apply simplification methods. Emphasis will be given to the analysis of wiring schematics and diagrams for accuracy and function. In addition, students will use electronic components to construct and troubleshoot digital circuits.

**Strand 1. 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.

**Outcome 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.

**Competencies**

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

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

1.1.3. Develop a career plan that reflects career interests, pathways and secondary and post-secondary options.

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

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

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

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

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

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

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

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

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

**Outcome 1.2. Leadership and Communications:** Process, maintain, evaluate and disseminate information in a business. Develop leadership and team building to promote collaboration.

**Competencies**

1.2.1. Extract relevant, valid information from materials and cite sources of information.

1.2.2. Deliver formal and informal presentations.

1.2.3. Identify and use verbal, nonverbal and active listening skills to communicate effectively.

1.2.4. Use negotiation and conflict-resolution skills to reach solutions.

1.2.5. Communicate information (e.g. directions, ideas, vision, workplace expectations) for an intended audience and purpose.

1.2.6. Use proper grammar and expression in all aspects of communication.

1.2.7. Use problem-solving and consensus-building techniques to draw conclusions and determine next steps.

1.2.8. Identify the strengths, weaknesses and characteristics of leadership styles that influence internal and external workplace relationships.

1.2.9. Identify advantages and disadvantages involving digital and/or electronic communications (e.g. common content for large audience, control of tone, speed, cost, lack of non-verbal cues, potential for forwarding information, longevity).

1.2.10. Use interpersonal skills to provide group leadership, promote collaboration and work in a team.

1.2.11. Write professional correspondence, documents, job applications and résumés.

1.2.12. Use technical writing skills to complete forms and create reports.

1.2.13. Identify stakeholders and solicit their opinions.

1.2.14. Use motivational strategies to accomplish goals.

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

**Competencies**

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

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

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

1.3.4. Identify how federal and state consumer protection laws affect products and services.

1.3.5. 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.

1.3.6. Identify deceptive practices (e.g. bait and switch, identity theft, unlawful door-to-door sales, deceptive service estimates, fraudulent misrepresentations) and their overall impact on organizational performance.

1.3.7. 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]).

1.3.8. Verify compliance with computer, copyright and intellectual property laws and regulations.

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

**Outcome 1.4. Knowledge Management and Information Technology:** Demonstrate current and emerging strategies and technologies used to collect, analyze, record and share information in business operations.

**Competencies**

1.4.1. Use office equipment to communicate (e.g. phone, radio equipment, fax machine, scanner, public address systems).

1.4.2. Select and use software applications to locate, record, analyze and present information (e.g. word processing, electronic mail, spreadsheet, databases, presentation, Internet search engines).

1.4.3. Verify compliance with security rules, regulations and codes (e.g. property, privacy, access, accuracy issues, client and patient record confidentiality) pertaining to technology specific to industry pathway.

1.4.4. Use system hardware to support software applications.

1.4.5. Use information technology tools to maintain, secure and monitor business records.

1.4.6. Use electronic database to access and create business and technical information.

1.4.7. Use personal information management and productivity applications to optimize assigned tasks (e.g. lists, calendars, address books).

1.4.8. Use electronic media to communicate and follow network etiquette guidelines.

**Outcome 1.5. Global Environment:** Evaluate how beliefs, values, attitudes and behaviors influence organizational strategies and goals.

**Competencies**

1.5.1. Describe how cultural understanding, cultural intelligence skills and continual awareness are interdependent.

1.5.2. Describe how cultural intelligence skills influence the overall success and survival of an organization.

1.5.3. Use cultural intelligence to interact with individuals from diverse cultural settings.

1.5.4. Recognize barriers in cross-cultural relationships and implement behavioral adjustments.

1.5.5. Recognize the ways in which bias and discrimination may influence productivity and profitability.

1.5.6. Analyze work tasks for understanding and interpretation from a different cultural perspective.

1.5.7. Use intercultural communication skills to exchange ideas and create meaning.

1.5.8. Identify how multicultural teaming and globalization can foster development of new and improved products and services and recognition of new opportunities.

**Outcome 1.6. Business Literacy:** Develop foundational skills and knowledge in entrepreneurship, financial literacy and business operations.

**Competencies**

1.6.1. Identify business opportunities.

1.6.2. Assess the reality of becoming an entrepreneur, including advantages and disadvantages (e.g. risk vs. reward, reasons for success and failure).

1.6.3. Explain the importance of planning your business.

1.6.4. Identify types of businesses, ownership and entities (i.e. individual proprietorships, partnerships, corporations, cooperatives, public, private, profit, not-for-profit).

1.6.5. Describe organizational structure, chain of command, the roles and responsibilities of the organizational departments and interdepartmental interactions.

1.6.6. Identify the target market served by the organization, the niche that the organization fills and outlook of the industry.

1.6.7. Identify the effect of supply and demand on products and services.

1.6.8. Identify the features and benefits that make an organization’s product or service competitive.

1.6.9. Explain how the performance of an employee, a department and an organization is assessed.

1.6.10. Describe the impact of globalization on an enterprise or organization.

1.6.11. Describe how all business activities of an organization work within the parameters of a budget.

1.6.12. Describe classifications of employee benefits, rights, deductions and compensations.

**Outcome 1.9. Financial Management:** Use financial tools, strategies and systems to develop, monitor and control the use of financial resources to ensure personal and business financial well-being.

**Competencies**

1.9.1. Create, analyze and interpret financial documents (e.g. budgets, income statements).

1.9.2. Identify tax obligations.

1.9.3. Review and summarize savings, investment strategies and purchasing options (e.g. cash, lease, finance, stocks, bonds).

1.9.4. Identify credit types and their uses in order to establish credit.

1.9.5. Identify ways to avoid or correct debt problems.

1.9.6. Explain how credit ratings and the criteria lenders use to evaluate repayment capacity affect access to loans.

1.9.7. Review and summarize categories (types) of insurance and identify how insurances can reduce financial risk.

1.9.8. Identify income sources and expenditures.

1.9.9. Compare different banking services available through financial institutions.

1.9.10. Identify the role of depreciation in tax planning and liability.

**Strand 2. 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.

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

**Competencies**

* + 1. Describe the structure of atoms and their relationship to electricity.
    2. Explain methods of producing electrical current.
    3. Explain how batteries store and disperse energy.
    4. Compare alternating current (AC) and direct current (DC).
    5. Define the units of measurement for voltage, current, power and resistance.
    6. Describe the relationships between voltage, current, resistance and power in circuits.
    7. Determine voltage, current, resistance and power in circuits using Ohm’s Law, Kirchhoff’s Law and Watt’s Law.

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

**Competencies**

* + 1. Compare conductors and insulators.
    2. Explain the uses of series, parallel and series-parallel circuits.
    3. Construct and troubleshoot series, parallel and series-parallel circuits.
    4. Analyze wiring schematics and diagrams for accuracy and function.

**Outcome 2.4. Electronic Components:** Describe the functions and purposes of electronic components.

**Competencies**

* + 1. Identify resistor values from color codes or other marks.
    2. Compare resistor compositions and their uses.

2.4.8. Describe the purpose and operation of common optical interface devices (e.g. light emitting diodes [LEDs], liquid crystal displays [LCDs]).

2.4.11. Define surface mount components.

**Outcome 2.5. Electronic Connections:** Connect individual components into an electrical circuit.

**Competencies**

* + 1. Define the purpose of a connection and the differences between a good and bad connection.
    2. Describe methods of electrical connections and the purpose for each method.
    3. Select type of electrical connection for electrical components.
    4. Protect circuit boards from electrostatic discharge (ESD).
    5. Use electrical connections to connect individual electronic units.
    6. Combine components per wiring prints, schematics and block diagrams.

**Outcome 2.6. Digital Electronics:** Create circuits to perform tasks and operations.

**Competencies**

2.6.1. Convert number systems (e.g. binary coded decimal (BCD) to decimal, and decimal to BCD).

2.6.2. Determine the output frequency of circuits.

2.6.3. Describe the purpose and use of logic gates (e.g. discrete and medium scale integration [MSI] gates, latches, flip-flops).

2.6.4. Design a paradigm for combinational logic problems.

2.6.5. Design a specific MSI gate application.

2.6.6. Describe the purpose and operation of programmable logic devices (PLDs) and complex programmable logic devices (CPLDs).

2.6.7. Describe the purpose and use of asynchronous and synchronous counters.

2.6.8. Determine fan-out and propagation delays.

2.6.9. Explain the purpose and use of a digital bus.

2.6.10. Explain the purpose and use of pulsers and logic probes.

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

2.6.12. Describe the purpose and use of digital-to-analog and analog-to-digital circuits.

2.6.13. Design a schematic for a digital circuit.

2.6.14. Utilize a counter in a circuit.

2.6.15. Utilize memory in a control system.

2.6.16. Construct a digital circuit based on schematics using solder and solderless techniques.

2.6.17. Test circuit function.

2.6.18. Use schematics and test points to locate subsystem, component and wiring failures in electronics products.